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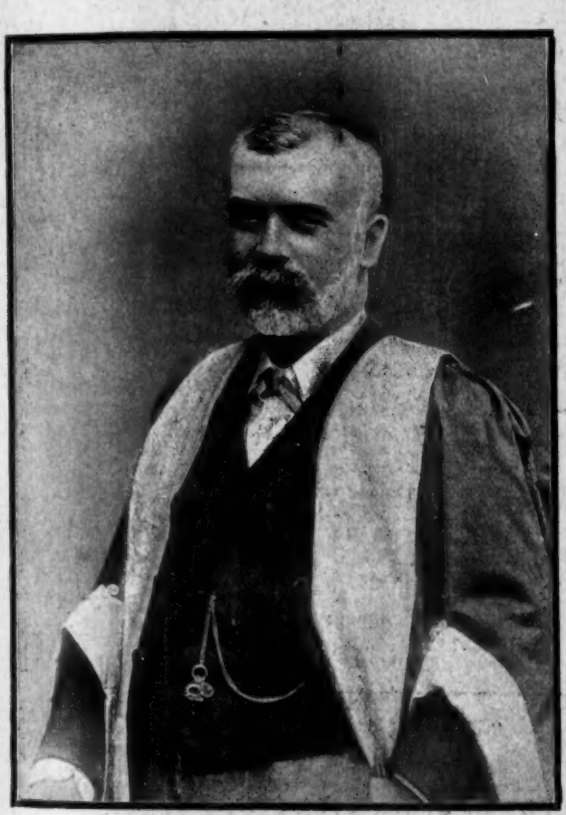

THOMAS A. STEWART, M.A., LL.D.

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'TIS SIXTY YEARS SINCE.

BY J. H. YOXALL, M.P.

I.

'TIS sixty years since, or rather, to be more correct, it is sixty-two or three. It was in 1842 that the Children's Employment Commission reported upon matters existing in 1841. Browsing along the overflow book-shelves of the House of Commons Library, I lighted upon their report. Incidentally it gave me certain pictures of the professional lives of teachers and the condition of working-class education two- or three-and-sixty years ago. Few things are more interesting than such peeps into the past of one's profession, and I am copying here in vignette the portraits of scholars and teachers dead and gone, though not long gone. Between the portraits of people in those days and of people in these there is all the difference which exists between the daguerreotype and the collotype, but the lineaments live in the old portraits all the same. We may learn from them what the state of elementary education and school teaching was only the day before yesterday, so to speak. The picture is dark, yet lurid.

Mr. John Matthews, aged thirty-five, was master of the Coleford National School, Forest of Dean; had been at the Bicknor and Berry Hill Schools several months by way of training. His wife was mistress of the girls' school; joint salary, £30, and the children's contributions, 2d. per week each. Boys, 50, and girls, 50, on books; average attendance, 30 of each. Total emoluments, therefore, £53. "Thinks one-fourth of the school are children of Dissenters; they all go to church." There were "4 boys and 7 or 8 girls in the Bible class, and 12 or 14 of each sex in the Testament class." Happy days, before the "religious difficulty"!

Mr. Charles Stockham, aged thirty-six, of the Newland National School, and his wife, got £50 without a house for their emolument. The "routine of education" sometimes "introduced the elementary rules of grammar, also Carpenter's *Explanatory Spelling Book*." Goldsmith's *History of England* had been introduced among the school lessons in the first class. Simple days, before Mr. Lowe's Revised Code!

Mr. Zachariah Jolly, aged thirty-three, with his wife, kept the National School at Cinderford. "Some of the children were as old as eighteen, having had no opportunity of being educated before." The Lydney National School was "under the especial patronage of Mrs. Bathurst, of Lydney Park" (which sounds like Jane Austen). "There are two children of Baptist parents in this school, and it has been agreed on by Mrs. Bathurst and the governess (Maria Foulkes, aged thirty-one) that these children should omit that part of the Catechism which relates to godfathers and godmothers, as it would be untrue from their lips." At Bicknor National School "the master, George Terret, the mistress, Mrs. Harrison, and the governess of the infant school, Mrs. James, appear to be well adapted to their various situations. Their respective salaries are £30, £16, and £12. One little boy, Thomas Jones, not quite three years old, reads a psalm throughout very correctly and fluently. The girls worked a very beautiful patchwork quilt and presented it to the Queen." At Berry Hill National School "the master, James Turnbull, is a man of superior qualifications, and has a salary of 12s. a week only; the mistress, Maria Rudge, has £15 per annum."

William Lambert, aged twenty-three, and Mary Shufflebotham, aged twenty-two, were master and mistress of the Kidsgrove National School, Staffs. "The system of instruction is a modification of Bell's. The children meet at nine and leave at half-past eleven; meet again at one and leave at four. They are taken to the pits at eight or nine years old. I was trained at Shelton, under Mr. Andrews; the mistress was trained at Rode

December Number:

PRIZE AND REWARD BOOK NOTICES.

Illustrated.

School in Cheshire, on the Lancasterian system." Here is the justification for the protests against narrowing the meaning of the word "trained."

At Cheadle Infant School the mistress, Caroline Morgan, witnessed that "there are now 56 on books; we had 97 before last Christmas holidays' examination. The falling off is consequent upon Dissenters not being allowed to come." (The religious difficulty begins to loom.) "The rector prevented their coming because the parents did not like them to go to the church. The Dissenters are talking of having a school of their own." (Commencement of the Free Church protests.) "The education consists in Scripture reading, spelling, multiplication tables, sewing, knitting, and marking. The room forms part of the factory." And, in what sounds almost a note of yesterday or to-day, Mr. Joseph Pegg, aged forty-eight, said, "The dispute between the rector and the parishioners never having been settled, has occasioned the withholding of my salary, the breaking up of the house in which the school used to be held, and the loss to the poor children, who are entitled to the benefit of all." (Commencement of the tenure difficulty, without any N.U.T. to assuage.)

The pupils were in as sorry a condition. Of the colliers in most of the coal-mining districts of Lancashire, Cheshire, and part of Derbyshire, the commissioner reported that among 1,113 males between thirteen and eighteen years old, there were 24 per cent. who could write their names; while of 216 females of that age there were 1·3 per cent.; of 603 males under thirteen years old, 8·5 per cent.; and of 90 females under thirteen years old, 2·2 per cent.

Writing appears to have been less seldom or less well taught than reading in those days, and was rather regarded as an extra, like "Shakespeare and the musical glasses." Thus John Attenborough, master of the Greasley Free School, Derbyshire, kept an evening school, charging 1d. a night for teaching writing, and 1½d. a night for teaching "writing and accounts." David Stenson, master of the Denby Free School, "takes about 20 private pupils—readers, 4d.; writers, 7d.; accountants, 8d. per week." This system of private pupils in the day school lasted till my own early days. I remember that in 1865 I paid "sixpence extra" a week to be in the "select class."

At the Netherthorp Free School, Butterfield, Mr. Squire was master. He received £24 a year, even though "he cannot recollect how long it is since he had a scholar; it is many years. He thinks he scarcely misses a day but he goes into the school, but it is years since he found any one there. He had between 30 and 40 at one time; not fewer than three of them learned Latin, but he never had a scholar who went further than Virgil." This suggests the old dominie in the tale of Little Nell. One can see very pathetically the aged man pottering into the schoolroom—"a fine old building, with desks, master's seat, etc., all in solid oak"—and looking round with bleared eyes behind his spectacles for the apparition of some casual scholar, living or dead. At Bonsall Free School the children had each to pay one shilling per winter for firing. Ireland echoes that to-day. "In accounts they principally only go through the first four rules of arithmetic; some few into fractions. The trustees seldom interfere." Here the schoolmaster's love of independence strikes a note.

Bit by bit, from these old silhouettes or faded glass portraits, something like a typical picture of the teacher and the teacher's circumstances sixty years ago will, I hope, have begun to form on the reader's retina. But the source I draw from is rich in details.

Thomas Medeley at Ruabon "teaches on the Lancaster system, *though he does not strictly adhere to it.*" Of course not. Nobody could. "Charges 1d. a week for reading, 2d. for reading and writing, and 3d. for reading, writing, and arithmetic." The schoolmaster at Plas Mostyn, on the authority of Daniel Ellis, underground agent at the colliery, was "not a trained teacher, but a pretty good teacher." He was "not very steady; had been a Dissenter," but "now goes to church." For many a year after that the schoolmaster was often a "common object" on the settles of the village inns. Mr. William Lloyd, of the Holywell National School, was not trained for a teacher. He "was a hairdresser," he said, and intended to return to his trade. "I am not sufficiently supported." There are still side-doors to our profession. David Edwards, schoolmaster at Blackwood, South Wales, said, "I receive my fees sometimes in goods." Truck system. "*I* built the schoolroom," said Thomas Lewis, master at Mynyoddyslwyn. A capitalist, it is plain. Mr. Thomas Phillips, schoolmaster at Whitchurch, said, "The branches of instruction commonly taught are reading, writing, and arithmetic. The teachers have had no other than common day-school instruction—certainly have no education, qualification, or training." What a philippic!

John Evans, schoolmaster at Tynygelly, said, "I belong to Pembrokeshire. I had a school in May last of from 40 to 50 boys, whom I educated on the faith of a subscription which was talked of, but which I never received. I carried on education in that faith for ten weeks." There are teachers in Wales with faithless salaries to-day. The room in which the school was kept at Hirwain was "small and inconvenient; no ceiling, bad walls, altogether more like a stable than a school; almost surrounded by a ditch of dirty water." (Within the past five years I have seen such schools not ten miles from London.) At Pontypool it was said, "The teachers are very *plain*, with a few exceptions." At Nantyglo there were "two children maimed in the iron-works who attend the school; the one has lost a leg, the other a hand." The master had been "trained for teaching under the National School system," but not in first aid to the injured, I fear. At Hirwain the children generally left school about eight or ten years old. At Merthyr National School "the clergyman generally gives the admissions." Root of the parson's power.

In Weardale a lad said, "I am fifteen. I can read, write, and cipher. I have read the Bible, English Reader, History of England, and nothing else. I have never heard of Manchester, Liverpool, or Dublin. I have heard of London; I have heard of Birmingham. I can say the Lord's Prayer, the Creed, the Ten Commandments, and the Catechism; I read them sometimes." But of Cumberland the commissioner reported (in words which perhaps explain the high standard of school attendance which in our own day the Cumberland children keep up), "The children in the lead country have the benefit of the example of their parents, and their encouragement to attend to their education." Right through the report from which I quote I keep coming upon the roots of present school conditions embedded in the past. This report is a perfect mine of such material, though the roots are not fossils yet.

(*To be continued.*)

BRITISH MUSEUM

BY MANY HANDS.

"Quot homines, tot sententiæ."

N.U.T. NOTES.

A FINER sight than the small concert room, St. George's Hall, Liverpool, presented on the evening of the last Friday in September one would have to travel far to find. The occasion was the conversazione and public reception held in connection with the twelfth annual Conference of the National Federation of Assistant Teachers, an organisation quite independent of the N.U.T., but whose close and friendly connection with the mother Union was evinced by the presence of Messrs. Sharples (President, N.U.T.), Allen Croft (Ex-President), Allcott, Boulter, Baddeley, Cosnett, Cullum, Dakers, Goldstone, Pickles, and Shawcross, and Miss Jobson (members of the Executive). The exquisitely proportioned and beautifully decorated hall was a sight in itself, and its attractions were increased by a profuse floral display on the stage. The delightful dainty costumes of the ladies still further enhanced the allurements of the scene, and altogether the function must be described as a brilliant success. At the public reception Mr. Westlake, Chairman of the Conference Committee, presided. He was surrounded by many of Liverpool and district's most representative men, some half-dozen of whom addressed a few words of welcome to the 340 delegates and friends then assembled. Considering that the speakers included a Lord Mayor, a Mayor, an M.P., the Chairman of an Education Committee, and the Chairman of an Elementary Schools Committee, the oratory was a little disappointing. Mr. Watson Rutherford, M.P., struck me as possessing the biggest heart, but even he, with the very best intentions in the world, managed to convey an altogether different impression from that which he desired. The heartiest reception was given, perhaps naturally, to Mr. George Sharples, whose peculiar privilege it was to convey to the delegates the felicitations of the mother Union. Nothing but unqualified praise can be accorded to the local Conference Committees for the thoroughness and excellence of their arrangements. Both at the conversazione and the banquet the following evening the delegates were their guests, and most royally were they regaled. So large, in fact, was the number of dinner guests that the splendid banqueting-room at the Adelphi Hotel could not hold them all. The companies came together for the toasts and musical programme, which latter was of unusual quality. The postprandial oratory will ever be remembered as noteworthy owing to the delightful manner in which the Rev. Dr. John Watson—the "Ian Maclaren" beloved of all students of Scottish character—gave the toast of the "Corporations of Liverpool, Birkenhead, and Bootle." Messrs. Pickles and Shawcross were also responsible for felicitous little speeches.

At Liverpool.

THE new President, Mr. E. C. Pritchard of Birmingham, was, from start to finish, a pronounced success. He was tactful, dignified, and ever courteous, and his ruling over one or two knotty points of procedure was prompt and correct. His brilliant address was excellently delivered, and I regret that considerations of space prevent more than the briefest reference to it. One of its most significant passages referred to the strenuous efforts now being made to attract entrants to the teaching profession. Said Mr. Pritchard:—

The President's Address.

"Attempts are now being made by establishing bursaries, by facilitating admission to the secondary schools, and in other ways, to attract candidates. This is increasing the attractions of the profession *at the wrong end*. The solution of the difficulty does not, in my opinion, lie in that direction. Why should it be necessary to offer inducements of this character in order to secure candidates for this particular profession? Is it not a tacit admission that there is something wrong? The fact is that, although education is extolled on all sides, the feeling still remains that *it must be run on strictly economical lines;* and if economy meant the mere saving of money, it would doubtless be more economical to offer a small bursary at the commencement of a teacher's career than to offer an attractive salary when that career reaches maturity. *But there is a form of economy that may prove very costly.*" And so on. One other quotation must suffice to show the quality of this fine address:—"It is a curious fact that, when a man shows himself an exceptionally gifted teacher, and receives promotion, the exigencies of our system leave him little or no time for teaching. Indeed the highest prizes of the profession are not associated with actual teaching, which thus loses in dignity and importance."

IN six and a half bustling hours not only was the purely domestic business of the Federation transacted, but time was found to pass resolutions dealing with A National System of Education, Training of Teachers, Large Schools and Classes, Salaries, Discipline in Schools, Confidential Reports, Inspection *v.* Examination, The Teacher's Register, Code of Honour, and Needlework. As a speaker, Mr. Frank Goldstone of Sheffield was *facile princeps*, and in the opinion of those competent to judge this gentleman is marked out for N.U.T. presidential honours. Three of the best speeches of the day came from Miss Lewis (Birmingham), Miss Billington (Manchester), and Miss Sparks (West Ham). They were in themselves sufficient to render the Conference a memorable one.

Business Done.

ONE of the most interesting chapters, to me, in the Report of the Board of Education is always that relating to superannuation and pensions. Despite the fact that the Act of 1898 has been described by *The Head Teacher* as "one of the meanest that has ever received the sanction of the House of Commons," nearly fifteen hundred teachers were, on March 31st last, benefiting from its modest provisions. Three hundred and seventy-eight men were in the receipt of superannuation allowances amounting in all to £13,704, 4s. (an average of £36, 5s. 1d. per head). The allowances of 239 women amounted to £6,198, 9s. 8d. (an average of £25, 18s. 8d. per head). When the Act was passed it was generally agreed that its most valuable part was that which provided for breakdown before the retiring age. At the end of March no less than 857 teachers were in receipt of disablement allowances, 249 men receiving £8,747, 1s. 7d. (an average sum of £35, 2s. 7d.), and 608 women receiving £14,927,

Superannuation.

19s. 5d. (an average amount of £24, 11s. 1d.). The table which shows the disablement allowances granted during the past twelve months is significant and instructive :—

Age.	Men.		Women.	
	No.	Total Annual Amount.	No.	Total Annual Amount.
30–40	4	£86 0 0	7	£124 6 8
40–50	14	462 0 0	48	1,032 0 0
50–60	27	1,050 9 3	73	1,973 19 8
60–65	24	860 1 7	31	873 16 6
Total.	69	2,458 10 10	159	4,004 2 10

Teachers will receive with very mixed feelings the intimation that "the Board of Education having certified to the Treasury under Section 1(3) of the Elementary School Teachers (Superannuation) Act, 1898, that the average salary of certificated masters for the year ended August 31, 1903, exceeded by 10 per cent. the amount specified in the sub-section mentioned—namely £119, 13s. 3d.—*the Treasury have intimated their intention to issue a warrant increasing the rate of contribution of men teachers to the Deferred Annuity Fund, to take effect from April 1, 1905.*" If the precedent set in the case of the women be followed, an additional six shillings per annum will be deducted from the men's salaries. I fear the contention of *The Head Teacher*—that "the basis of the scheme must be altered: a proportionate pension recognising length of service and *amount of salary*"—is not likely to be successful just yet. If there be a differentiation in the amount of the Government subsidy, I'm not sure whether the equitable plan would not be to make it vary *inversely* as the teacher's salary. But why not concentrate on increased subsidies all round?

* * *

Where shall we Live?

WHEN the East Ham Education Committee issued their infamous fiat requiring all their teachers to live within the borough boundaries, I passed the matter over, deeming it to be mere midsummer madness. Now I find the bad example spreading; for at the beginning of October the Tipton Education Committee have been responsible for a similar atrocity. The mover of the Tipton resolution certainly gilded the pill by pretending that the teachers' mere presence amongst the children would be "a great moral living influence." The cloven hoof, however, immediately appeared when he stated that in addition to this magnetic influence "the shopkeepers would benefit by their living in the parish." Of course this is veriest nonsense, calculated to have the opposite effect to that intended. So long as the teachers arrive at school fit and fresh, able to perform their arduous duties, it matters little where they live. Naturally, committees might complain did teachers live so remote from their work that great physical weariness was apparent at the commencement of the day's toil. As a matter of fact, it is often much easier to reach certain schools by living outside a town's boundaries than by residing in certain quarters inside those limits. One of my colleagues, for example, who lives six or seven miles from Nottingham, can more easily get to school than I, domiciled near the heart of the city. I am tempted to wonder whether *all* the public officials at East Ham and Tipton are required to inhabit those delectable boroughs. And why stop at residences, forsooth? *Ce n'est que le premier pas qui coûte.* Sumptuary laws and the revival of the curfew (for teachers only) come in easy gradation.

The "B. and O." Council.

THE principal business at the last Council meeting was the adoption of certain proposals for pensioning the officials of the fund. Every one was in favour of the principle involved, and although Messrs. South, Wells, and Coward strove hard to postpone the discussion of the scheme, in the end it was adopted with practical unanimity, and will now be submitted to the annual meeting of subscribers at Llandudno. The greatest credit is due to Mr. C. W. Hole, who, as Chairman of the Finance Committee, had drafted the scheme and furnished the Council with reliable data as to cost, etc. He had the satisfaction of seeing his ideas adopted, with a minimum of alteration. He acknowledged his indebtedness to the schemes for pensioning the officials of the N.U.T. and L.T.A. for some of the details. When it is understood that the setting apart of a yearly sum of about £75 will provide pensions of £100 for the assistant secretary, £70 for the chief clerk, and £52 for each of the lady matrons of the boys' and girls' homes, it seems good *business* to deal with the matter at once. If the annual meeting agree, the pension scheme will date from June 1, 1905. A. C.

NOTES FROM THE NORTH.

The September Meetings.

"THE Saturday immediately following the third Friday in September," as the Royal Charter of the Institute phrases it, is the annual red-letter day in the calendar of Scottish teachers, for it is on that day that the Educational Institute of Scotland holds its annual business meeting in Edinburgh. Each local association is entitled to send one delegate to this meeting for every six graduates it has, so that this year, owing to the great increase in the membership, there would be fully twelve hundred delegates chosen. If we take into account, too, the fact that many teachers, who are not delegates, avail themselves of this excellent opportunity of seeing the very attractive exhibit of school books and apparatus, and, like the Athenians of old, trying to find something new and up to date in connection with their everyday work, as well as of renewing their acquaintance with many of their former fellow-students, we are within the mark when we say that fully two thousand Scottish teachers were present at the Royal High School on the 21st September, the date of the fifty-eighth annual meeting of the Institute. It is a pity the clerk of the weather could not in some way advise beforehand what sort of weather we were going to have, so that on a good day, such as we had, the inconvenience caused by the stuffy and uncomfortably crowded classrooms might be avoided by the publishers arraying their exhibits in the quadrangle.

* * *

The Burgh and Parochial Schoolmasters.

THE veterans of the profession, whose ranks have been considerably thinned during the past year, take precedence, as is but natural. They hold their meeting on the Friday. There was a muster of about thirty O.P.'s. Mr. Young, one of the secretaries, reported that the committee had communicated with the Secretary for Scotland anent the rights and privileges of Old Parochial Schoolmasters, as secured by the Act of 1872; also in regard to the age limit of sixty-five as it affects schoolmasters in office in respect to Privy Council pensions, and their desire that the option of retiring at sixty-five should be more fully granted; and

that for the fixing of retiring allowances the exact legal meaning of the term *salary* should be ascertained. Mr. Graham Murray's reply was that their rights and privileges would not be endangered by contemplated legislation. In regard to retirement at sixty-five and to retiring allowances, he stated that these were outwith the scope of probable legislation, and might more properly form the subject of representation in connection with future revisions of the Code. The treasurer reported that the following allowances had been granted during the past year—namely, one each at £200, £170, £120, £113, 6s. 8d. + a house, £106, £105, £100, £76, £75, and two each at £80 and £70 respectively. The average works out at £105, 0s. 6d.—a very good argument, surely, for the raising of the allowances granted under the Superannuation Act of 1898.

IMMEDIATELY after the above meeting the trustees of the Widows' Fund—practically the same individuals—held their meeting. The president, Mr. Thomson, Perth, intimated that as the result of their last investigation they were able to give the widows an increase in their annuities, and they hoped that in the near future they would be in a position to still further augment them. The number of contributors to the fund at the present date was 284, and at the same period there were 260 widows. The cashier, Dr. Cameron, reported that £5,832 had been paid in 1903. The fund now stood at £94,487, 1s. 5d., the decrease for the year being only £1,826, 0s. 8d., so that the interests of the residuary beneficiaries are being carefully safeguarded. Is it wonder, therefore, that among the younger teachers on the Saturday there was a desire to start a Widows' and Orphans' Fund?

The Schoolmasters' Widows' Fund.

THE annual meeting is usually preceded by the gathering of "fellows," who have the final say in the recommendation of the "new fellows" by the Board of Examiners. This year the number was rather larger than usual. There were forty-eight recommended by the local association, and eleven from *furth* of Scotland, who had made direct application to the Secretary. Those hailing from south of the Tweed were as follows:—Messrs. Robert V. Allen, A.E.I.S., Royston; Isaac T. Cutting, London; William Bryn Davies, Glamorgan; William Ford, A.E.I.S., Northwich; James W. Hammond, Harrowgate; James H. Lewis, Twickenham; Rev. E. F. Padmore, A.E.I.S., Winchfield; Henry G. Savory, Wisbeach; M. L. Winterton, Salisbury; H. Russell, Liverpool; R. S. Cahill, Heckmondwike. There is a growing feeling that the Institute is somewhat prodigal in the granting of degrees, and I should not be surprised were the number in future years to be considerably restricted.

Meeting of Fellows.

WITH that commendable punctuality which characterises this meeting, the President (Mr. T. Wallace, F.E.I.S., Inverness), accompanied by the "stalwarts" of the Institute, took the chair. The attendance was very large. The informal business dispatched, the President rose to deliver his retiring address. After referring to the extending and deepening interest in the work of the Institute, not only among the members but also among the general public, he referred to the now defunct Education Bill for Scotland. He expressed the hope that, when Parliament reassembled, the Bill would get a first place on the roll of business, and the unanimous support of the Scottish members. He thought that when it passed it would be an epoch-making Bill, and one with which the teachers would be well satisfied, for it embraced many of the reforms which they had been advocating for years, and it was the first Bill that recognised the wisdom of consulting practical educationists in the administration of local educational affairs. He then proceeded to emphasise one or two of the points which appeared to be the beginning of great things for education in Scotland and for the teachers.

President's Address.

AS was naturally to be expected from a Highland President, his address was highly tinctured with Highland colouring. There can be little doubt that the question of educational equipment and training is in the northern part of our island a pressing one. On the subject of co-ordination of schools he said that whether or not the enlarged School Board areas would justify expectations as to security of tenure of office and promotion, one thing at least would undoubtedly be accomplished—namely, the much-needed co-ordination of education within the new areas. One of the first things to be done by the new School Boards would be to gather up all the threads of the tangled meshes of educational network within the area, and to begin anew to rearrange existing educational facilities, and to supply what is wanted to made a complete system. Primary, secondary, and technical education must be so arranged as to reduce the waste of time and energy to a minimum. In the primary schools there must be a preliminary training in secondary and science subjects, to give the pupils in these schools a chance to set their feet on the first rung of the educational ladder. The Bill has been called a Secondary Education Bill. In so far as its aim was to place secondary and technical education on a more solid foundation, the President welcomed it; but if it began by looking at secondary apart from primary education, it would be a mistake, for the sooner we took the different grades of education out of the watertight compartments in which they had been too long isolated the better. To reduce the teaching in the primary schools to mere elementary work would not only lower the standard of our Scottish education, but the status of the teacher. It was in these schools that the selection of pupils for secondary and technical work must begin. The teachers in our smallest rural schools must be qualified to teach secondary subjects, if the pupils were to have an equal chance with those in the larger rural and urban schools, and if the teachers themselves desired promotion from primary to secondary schools. Again, many of the schools were so situated that it was absolutely necessary that a certain amount of secondary work should be done in them if the children were to have a fair chance in the race for life. It was the duty of the teachers of such schools to discover the boy or girl of "pairts," and by every means in their power to aid and encourage them.

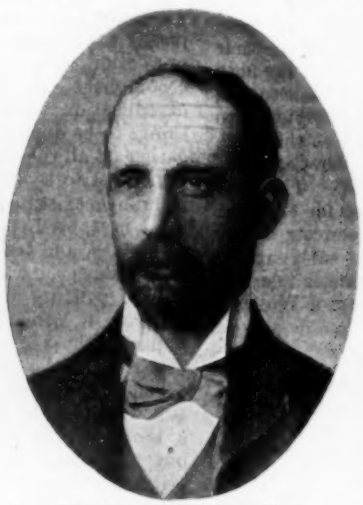
Co-ordination of Schools.

ONE of the subjects that during recent months has come into prominence is the question of the training of teachers. Dealing with this, Mr. Wallace said an Education Bill did not produce a body of suitably-trained teachers. The training of teachers had not been dealt with in the

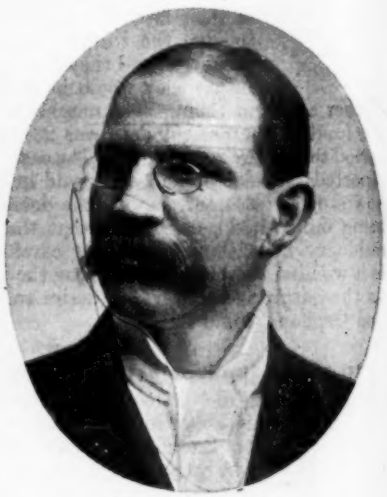
Training of Teachers.

proposed Bill, but it was the prime factor in every scheme of education, and would require to be considered in due course. Too much attention had of late, he thought, been given to intellectual qualifications, and too little to the practical training of teachers. What, he asked, were the value of intellectual training and brilliant scholarship to those who had not been trained to impart the acquired knowledge to young minds? Scholarships did not of necessity make a successful teacher. It was, however, of the utmost importance that those who intended to become teachers should be trained how to teach, and there should be one training for all. It was a mistake to classify teachers as elementary, secondary, and technical while under training, for no one could be a successful teacher in any one particular school without knowing something of the others. There were a few terms in connection with education it would be well to get rid of. "Elementary teacher" was one, and "class teacher" was another. He would have every one obtain the same training, and by practical experience rise to the higher positions in the profession. He was strongly in favour of apprenticeship. It was a pity that the pupil-teachership had not been made more attractive of late years. Poor pay, hard work, difficult examinations, and poor prospects had all tended to diminish the number of applicants. He would have the salaries during apprenticeship increased, the amount of study lessened, and more time given to the art of teaching. He thought if apprenticed pupil teachers had a preference in future appointments there would be no lack of applicants. Parenthetically, I question very much whether the increase of salaries during apprenticeship would be the means of making brighter prospects.

MR. JAMES YOUNG, M.A.



MR. ROBERT DICKSON, M.A.



MR. S. M. MURRAY.

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ON this subject the President spoke with an eye to the needs of the north. He thought the present training colleges had done admirable work, but the time had come when the country could no longer depend upon the liberality of Churches for the supply of teachers. With a national system of education there should be national training colleges or suitable courses for teachers in our universities. The present training colleges, from their limited accommodation, are quite inadequate to keep up a proper supply of teachers. If it were thought advisable to continue these, they would require to be enlarged to suit the larger demands, and their numbers increased and placed under the charge of some new authority, such as the School Boards or Provincial Councils. A training college was much wanted, for several obvious reasons, in the north-west; and now that Gaelic was to have a place in the curriculum of the training of teachers for Gaelic-speaking districts, there could be no place more appropriate than Inverness. At first sight there was one apparent drawback to Inverness as a training centre—namely, the want of a university; but this difficulty might, he thought, be got over by allowing the students to take the degree examination as extra-mural students of Aberdeen University. Seeing that we were within reasonable hope of a Provincial Council in Inverness, a training college would make the educational machinery complete for the north-west.

Training Colleges.

BEFORE concluding his address, the President moved, on behalf of the Institute, the following resolution:—"While thanking His Majesty's Government, and particularly Mr. Graham Murray, for the introduction of the Education (Scotland) Bill, 1904, the terms of which were generally approved by the country, the Educational Institute of Scotland deplores the failure to place it on the Statute Book, and respectfully urges upon the Government the necessity for giving it a prominent place in the legislative programme for next session, with a view to its passing into law." The resolution was unanimously carried.

The Institute and the Bill.

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MR. JAMES YOUNG, M.A., Rector of Biggar High School, was proposed from the chair as the new President. With the election of Mr. Robert Dickson, M.A., Edinburgh, as Vice-President, and the re-election of Mr. J. Lawrence as Secretary, and Mr. S. M. Murray as Treasurer and Organising Secretary, the merely formal business was at an end. In last month's notes I anticipated the financial statement and report of the organising

Election of Officials.

secretary as regards the finances and membership of the Institute. On the whole, the Institute progresses apace, and the essentials of a thoroughly vigorous life are in full evidence. It was agreed, on the invitation of the Ayr Local Association, to hold the next Congress at Ayr during the New-Year holidays. Dr. Dickie was re-elected Secretary to the Board of Examiners.

THE afternoon was devoted to the purely domestic affairs of the Institute, which on several occasions were discussed with great animation. It was agreed to adhere to the scale of salaries drawn up by the General Committee of Management, and the Secretary was instructed to issue it to all School Boards in Scotland. On the question of the establishment of a Widows' and Orphans' Fund, Miss Fish, Convener of the Ladies' Committee, in a most convincing and highly-applauded speech, moved the previous question. She was opposed to the proposal, not from want of benevolence, but because she had never had it proved that the widows and orphans of the teachers in Scotland were in necessitous circumstances. She could not see any equity whatever in bringing forward such a large scheme unless the women were to share in the benefit. The previous question was carried. Considerable discussion took place on the election of the General Committee, and the rules of the Institute had to be broken to allow a nominee from Banffshire to be elected. On the whole, it may be said that no new speaker has appeared to make a reputation. The speaking was in the hands, very largely, of the older members. The President, by his genial manner and tact, managed to keep the meeting in good form, and there can be little doubt that Mr. Young's election will encourage the younger members of the profession in their desire to see in the presidential chair a greater number of younger men.

Afternoon Sederunt.

IT is now customary to hold a ladies' meeting after the annual business meeting is over. Its object is to promote friendliness among the lady members, and to awaken a deeper interest in the affairs of the Institute. Miss C. Cameron, Newburgh, occupied the chair. The first paper dealt with the subject of the alphabetic method of teaching reading, and was given by Miss M'Kie, Dumfries. The paper was followed by much discussion. The followers of the phonic method claimed for their method entire success. The general feeling favoured a combination of both methods. The "Salaries of Women Teachers" formed the subject of the paper given by Miss Whitton, Kirkcaldy; while Miss Lang, Lochgilphead, dealt with the "Salaries of Rural Women Teachers." Miss Whitton treated the subject from the following four standpoints:—(1) The general inadequacy of the salaries, (2) a comparison between the salaries of women and of men class teachers, (3) the salaries of infants' mistresses as compared with women and men class teachers and headmasters, and (4) lack of equality in various districts with regard to women's salaries. In contrasting rural teachers with their more favoured sisters in urban centres, Miss Lang argued that if only because of their isolation they ought to receive a better remuneration than at present. Frequently when no male teacher could be induced to accept a mastership in some remote school, a lady was appointed at a reduced salary. She urged teachers to refuse to accept positions where they would not receive at least a salary in proportion to their services and their responsibility. Miss Hamilton, Glasgow, in the course of the discussion, referred to the unprofessional action of many in accepting situations at home at less salaries, which was really "underselling." Miss Fish, Convener of the Ladies' Committee, gave a brief account of the work done by that committee. There can be little doubt that the retirement of Miss Fish from the General Committee is a matter of great regret, inasmuch as her work on that committee has been of the very highest order. I trust she will soon return to the work again.

The Ladies' Meeting.

COMMERCIAL INSTRUCTION IN GERMANY.

THE latest of the valuable series of reports issued by the Foreign Office comes at a very opportune moment, for in it Dr. Frederic Rose, H. M. Consul at Stuttgart, deals with the subject of commercial instruction in Germany in an exhaustive manner, supplying a mass of facts and figures that should prove useful both to the politician seeking to promote the commercial supremacy of his country, and also to the teacher who is anxious to arrange a scheme of instruction that will prove of benefit to his pupils in after-life.

The movement for the provision of commercial instruction in Germany dates from the beginning of the eighteenth century, when the "Mathematical and Mechanical Real-School" was founded at Halle. The expression "real" used to qualify the words school or gymnasium signifies a school of an originally predominating classical tendency which has been modified and adapted to more modern requirements by the diminution or elimination of classical subjects and the addition of science, mathematics, philosophy, and drawing, and more recently of commercial and agricultural subjects.

Since the founding of the real-school at Halle others have been established with a view of providing either a short course of commercial instruction for pupils who had acquired a certain degree of preliminary education, or else a longer course of instruction not only in purely commercial, but also in general educational subjects. The latter half of the nineteenth century saw the establishment of purely commercial schools, where the scope of the instruction has been broadened and deepened so as to provide commercial instruction in every possible grade. So popular are these commercial schools that at the present time there are no less than 429 of them, exclusive of private commercial schools and commercial schools for women.

The establishments at which commercial instruction is given may be divided into three classes:—

1. Commercial universities (Cologne, Leipsic, Frankfort, and Aix).

2. Higher commercial schools and real-schools with commercial courses.

3. Commercial continuation schools.

The commercial universities for higher commercial instruction have been founded within the last six years, and mark an important step in the development of commercial instruction in Germany. Their aim is to afford persons engaged in business and industry on a large scale, masters at commercial schools, administration officers, bank officials, consular officials, secretaries to chambers of commerce, and so forth, a deeper and broader measure of instruction in commercial and

national economical matters than that provided by the various commercial schools. The special province of the commercial university lies less in the mere acquisition of commercial technical knowledge and attainments for immediate practical detailed application than an attempt to provide a general mental schooling for the higher branches of the commercial profession. They are intended to awaken and develop the mental faculties of a merchant, to enable him to grasp the inner working and meaning of national and international economy, and to understand and judge its causes and results, its temporary and permanent phenomena. Generally speaking, the instruction is arranged to include the following subjects: political economy, commercial history and geography, commercial law in all its aspects, the organisation and management of commercial undertakings and their technical details, industrial law, financial science, bank, exchange, monetary, and credit operations, state and administrative law, and so forth.

The university at Frankfort-on-the-Main was opened in October 1901 with a staff of eight fully-qualified professors, but it was soon necessary to increase this number, and there are at present eleven professors, four assistants, and twelve visiting lecturers. The students are divided into two classes—full-time students, and those only attending one course of lectures. Although the university has only been opened such a short time, the advantages of a full-time course are already being recognised, and the number of students availing themselves of these advantages will be seen from the following table :—

	Full Course.	*One Course of Lectures.*
Winter 1901-2	36	425
Summer 1902	45	308
Winter 1902-3	95	317
Summer 1903	121	216

This university is under the supervision of the Prussian Ministry of Industry and Commerce. Three examination boards exist at present, composed of the Mayor of Frankfort as president, and the professors of the subjects in question. Diplomas are granted in commercial science, for masters in commercial science, and for experts in insurance.

The Aix Commercial University is not an independent institution, but forms the department for commercial science of the Aix Technical University. The conditions of entrance at Aix are more severe than those of the other universities, for whereas the qualification for the one year's military service is accepted at the other universities, Aix insists that its students shall have completed the full curriculum of a classical, semi-classical, or modern school with nine annual classes; but in spite of this there are over a thousand students who have matriculated.

The special feature of the Cologne University appears to be the attempt to combine theory and practice. This is shown by the character of many of the lecturers. Experienced judges and barristers lecture on legal matters, a railway official and expert on trading facilities, a trades inspector on the experience gleaned in the exercise of his calling, a higher customs official on the "technics" of customs, a bank official on the functions of the banking system, an insurance expert on the organisation and advantages of insurance systems, and so forth. Thus the staff contains twenty-eight such practical men to only seven fully-qualified professors.

Turning to the financial side of the question, it appears that Leipsic and Aix were founded and the major portion of the expenditure borne by their respective chambers of commerce; Frankfort secured its university by the generosity of the inhabitants of the town; while Cologne owes its foundation to the munificence of Dr. Von Mevissen, who provided in all £37,000 for this purpose.

The fees charged are as follows :—

	Entrance Fee.	*Fee for Lectures.*
Aix.	10s.	4s. per week in winter and 3s. per week in summer.
Cologne.	£1.	£6, 5s. per term (£12, 10s. for foreigners).
Frankfort.	None.	£6, 5s. per term (£12, 10s. for foreigners).
Leipsic.	£1.	4s. per week.

It is by no means improbable that more commercial universities will be founded in Germany in the course of the next few years. In North Germany they are proposed for Berlin, Hamburg, and Hanover. The Berlin Commercial University is definitely decided upon, and the buildings are being constructed. In South Germany they are proposed for Munich, Nuremberg, Stuttgart, and Karlsruhe. This furnishes ample proof of the success of the existing universities.

Leaving the universities, we now turn to the second class—the higher commercial schools and the real-schools with commercial courses. The scope of the instruction given, the conditions and qualifications for entrance, etc., vary very much in these schools, the mere fact that they were founded by the most varied bodies precluding any possibility of uniformity in their organisation.

The entrance conditions of these schools range from the leaving certificate of the elementary schools through several intermediate degrees to the standard for the one year military service. The instruction is arranged for periods ranging from one to six years, and naturally we find, as a rule, the shorter the period of instruction the higher the standard of general qualifications required. The general scope of the instruction given is of a technical nature, so that while the universities initiate the heads and leaders of commerce into the intricacies of commercial organisations and the various aspects of industry and commerce, the higher commercial schools provide these leaders with an army of well-trained subordinates possessing a thorough knowledge of business routine.

The Leipsic school may be taken as an example to show the quality and scope of the instruction given in these schools, and the number of hours per week devoted to each subject :—

Subjects of Instruction.	*Hours per week.*		
	1st Year.	2nd Year.	3rd Year.
German	4	3	4
English language and correspondence	5	4	5
French language and correspondence	5	4	5
Mathematics	3	3	3
Commercial calculations	5	3	2
Physics	2	2	—
Technology	—	—	2
Chemistry	—	2	2
Knowledge of goods	—	—	1
General and commercial geography	2	2	2
General and commercial history	2	2	2
Commercial knowledge, commercial and exchange law	—	2	1
Office work, correspondence, and book-keeping	—	3	3
Political economy	—	—	2
Calligraphy	2	2	—
Shorthand	2	1	1
Gymnastics	2	2	2
	34	35	37

Italian (two hours in the third year) and Spanish (two hours in the second and third years) are optional. Admittance to the above course is not very severe. Pupils must be at least fourteen years old, and pass an entrance examination.

The majority of these commercial schools are in receipt of state aid, and the fees vary from £1 per annum at Cannstatt and Heilbronn to £7, 10s. per annum at Munich.

The commercial continuation schools are the most numerous of all the commercial schools in Germany. Their importance has been realised, principally during the last fifteen years, with the results that their number and attendances have made most rapid strides. Without doubt this increase has been stimulated by the laws enacted in various states for the compulsory attendance at continuation schools of boys between the ages of fourteen and seventeen who have passed through the elementary schools. These commercial continuation schools are either independent institutes or attached to trades schools. The instruction is, of course, much less extensive and more elementary than that given at the secondary commercial schools described above. It is destined for apprentices and boys engaged in business during the day, who can only spare a few hours per week for training in commercial subjects. The instruction is given principally during the daytime—from six to nine in the morning, during the midday hours from twelve to two, and on certain days during the afternoon from two to five. As a rule, from four to twelve hours' instruction per week are given, the duration of the courses ranging from one to three years. The schools are supported by the municipal and communal authorities, commercial guilds, chambers of commerce, various associations, and private persons. About half their number are in receipt of a greater or less measure of state aid.

Berlin has six such schools, with a total attendance of 2,240, the fees ranging from eighteen shillings to twenty-seven shillings per annum. At Magdeburg and Nuremberg there are large schools with over a thousand pupils in attendance, but these schools are not confined to the large towns. Mittweida has a school of sixty-three pupils, with a staff of eight masters; and Werdau provides nine masters for seventy-seven pupils.

The average number of hours' instruction received each week appears to be about twelve, and the following table showing the distribution of this time among the various subjects at the Leipsic school may be taken as a fairly representative example. The instruction is intended for apprentices engaged in business in Leipsic, and is given during a three years' course.

Subjects.	*Hours per week.*		
	1st Year.	2nd Year.	3rd Year.
German	2	1	1
English	—	2	2
French	2	2	2
Commercial calculations	4	3	2
Commercial knowledge	—	1	1
Office work and book-keeping	—	1	2
Correspondence	—	—	1
Commercial geography	1	1	—
Writing	2	—	—
Shorthand	1	1	1
	12	12	12

The instruction is given from seven to nine in the morning, or from two to four in the afternoon. The fees amount to £5 for non-apprentices, and £3, 15s. for apprentices. Applications for admittance are made by the proprietor or manager of the business in which the apprentice is serving his time; the same person must allow the apprentice sufficient time to attend the school and finish his home-work. He also pays the school fees. Intending pupils must undergo an entrance examination, the standard of proficiency required being rather beyond that of the leaving certificate of the elementary school.

Many towns now provide commercial schools for girls. The commercial school for girls at Düsseldorf may be taken as an example. It consists of two divisions with a one year's course each. The aim of the upper division is to provide girls possessing a good preliminary education with such a measure of commercial knowledge as will enable them to enter any branch of business life. The aim of the lower division is mainly the training of apprentices, consequently the entrance conditions are lower.

The general plan of instruction provides for the following subjects and hours per week:—

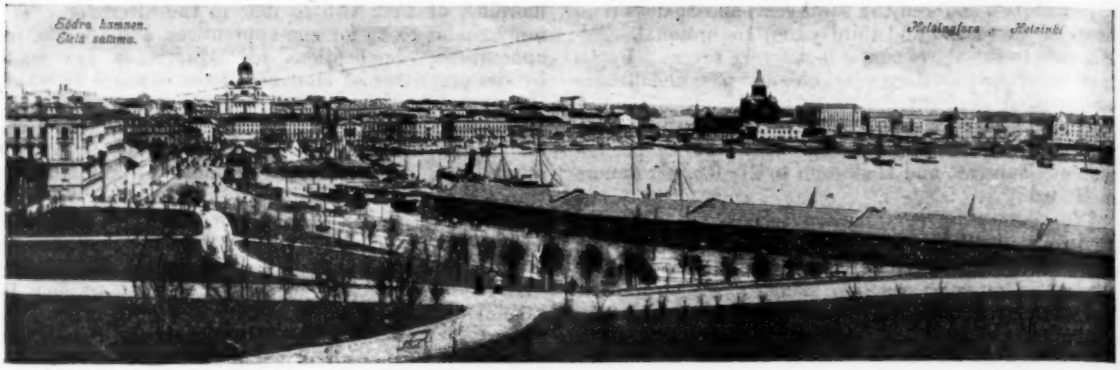
Subjects.	*Hours per week.*		
	Upper Division.		Lower Div.
	1st Half Year.	2nd Half Year.	
German	2	—	3
German correspondence	2	4	2
French	4	4	4
English	4	4	4
Commercial calculations	4	4	4
Book-keeping	4	4	4
Commercial geography	2	3	2
Calligraphy	2	—	2
Typewriting	2	2	2
Shorthand	3	3	3
Commercial management	2	—	2
German commercial knowledge	—	3	—
Political economy	2	2	—
	33	33	32

The discipline maintained at the school is severe. It even extends beyond the schools, as pupils are not allowed to visit concerts and theatres without permission of the school inspector or master of the class.

The perusal of the present report demonstrates what immense importance is attached in Germany to commercial instruction in all its branches, and what remarkable progress has already been made in the foundation, organisation, and maintenance of schools for this purpose. Commercial men in Germany are almost unanimous in the opinion that German trade has benefited by the provision of thorough practical and theoretical instruction for all classes of persons engaged in commercial callings.

With regard to the details of the instruction, it is truly remarkable how all branches of knowledge bearing upon the subject are condensed and focussed upon the one central and prevailing purpose of commercial utility.

Special notice may also be directed to the great attention devoted to foreign languages, and most especially to English. A large and constantly-increasing number of German merchants are able to draw up their own catalogues and circulars in English. Although these are often faulty, yet they serve their purpose well, and contribute to the export of German goods to the United Kingdom and her colonies.



A SCAMPER THROUGH FINLAND.

BY J. EDWARD PARROTT, M.A., LL.D.

(*Continued from p. 174.*)

HELSINGFORS is a delightful city. It is Stockholm on a smaller scale, with fine stone buildings, modern streets, good shops, and an air of moderate prosperity. It sits nobly on a strip of land deeply pierced with fiords, and jutting out into the Gulf of Finland. Almost every street gives you a glimpse of the blue sea. Facing the harbour you have a green observatory hill to your right; behind you are beautiful gardens with green lawns, flower beds, and cafés at which bands play in the evening. In the middle of the promenade is a statue to Runeberg, the Finnish poet and patriot. To your left, high above the city, stands the noble St. Nicholas Cathedral. Not far away is the Russian Church, with its gilded dome and minarets, perched on a granite rock. The harbour is studded with islands. One of them, Högholmen, is Finland in miniature. It contains the most northerly zoological gardens in the world. Sveaborg, the "Gibraltar of the north," crowns seven rocky islands, and is considered very formidable indeed. Right in front are several bare islets, one of which is occupied by a café where a band of lady performers discourses excellent music during the summer season.

One is not long in finding one's way to the Senate Square. One side of it is shut in by St. Nicholas Cathedral, which is fronted by the statue of Alexander the Second, a noble piece of work by one of Finland's gifted sons. At the base are sculptured groups representing Lex, Lux, Pax, and Labor. To the right is the Senate House, which has a morbid interest as the scene of Governor-General Bobrikoff's murder by Eugene Schaumann in June last. To the left is the university, with its two thousand odd students, and near at hand are other state buildings.

We are now standing at the heart and centre of Finnish government, and the moment is propitious for making a few remarks on her political condition. The story is a sad one: it is a story of a base attempt to stamp a nationality out of existence, to crush an educated people, long habituated to constitutional government and exercised in political power, into the Procrustean bed of a blighting absolutism. Until February 1899 no part of the Russian Empire was so peaceful and so contented as the grand-duchy of Finland. The government of Russia has been called a despotism tempered by assassination, but up to the present year no political crime sullied the fair pages of Finnish history. Her people have no taste for conspiracy; their ideals are centred in peaceful pursuits and intellectual achievements; they love their land and its institutions with a passionate affection, and an intolerable goad has been needed to rouse active animosity against the government of the Czar.

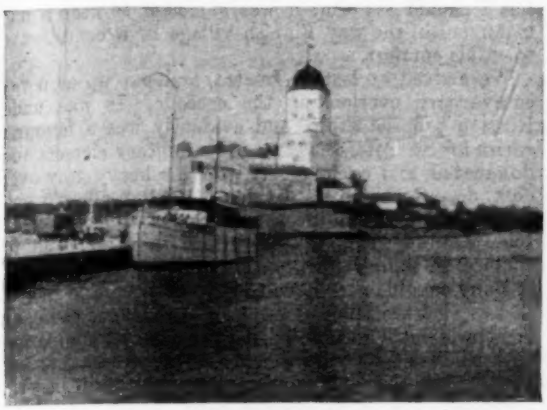
Finland became Russian under an "Act of Union" in 1809, after a long association with Sweden and a deep participation in its language, culture, and institutions. Alexander the First, that high-minded and liberal emperor, solemnly decreed and promised "to confirm and ratify the religion and fundamental laws of the land, as well as the privileges and rights of each class, be their position high or low." All these benefits and laws he promised, in the most explicit and unmistakable manner, to maintain "firm and unshaken in their full force." And this solemn oath of fidelity every successive Czar has sworn at his coronation. Up to 1899 Finland presented the unique spectacle in Russia of a free constitutional state, with the rights of self-taxation and self-legislation. To the Russian progressive she was a beacon of hope; to the reactionary she was an eyesore and an anomaly. Six years ago the Russification of Finland began; it is proceeding apace. The tragedy is nearing its climax, and the friends of freedom everywhere must be saddened at the thought.

The curse of the Tower of Babel hangs heavily over Finland. At the corner of every street you see its name in three languages—Russian, Swedish, and Finnish. The upper classes speak Swedish, and it is largely spoken by the peasantry along the shores of the Gulf of Bothnia. The bulk of the people, however, speak Finnish, which is a remarkable language in many ways. It is musical, soft, liquid, very expressive and poetical, and, like Italian, lends itself admirably to singing. Its grammatical contortions, however, are heartrending; there are actually sixteen cases. Composite words, as in German, are common. As an instance, take this piece of multipedalia, which represents Finnish at its very worst—*Opittomattomuudessankin*. Characteristically enough, it means "even in his ignorance."

Many of the Helsingfors merchants and professional people speak English fluently. We had one remarkable instance of a most unexpected knowledge of English in a little guest-house at Himango, a small place many miles from the railway, on the shore of the Gulf of Bothnia, between Uleaborg and Gamla Karleby. When we entered the house my wife asked for *thé*. The woman in charge divined our nationality in a moment, and to our unspeakable amazement replied, "*Cup o' tay! Oh aye! Want any grub?*" We subsequently discovered that she had lived for some time in Hull,

and, like most foreigners in this country, had acquired a passable fund of slang.

From Helsingfors we journeyed to Viborg, a clean,



VIBORG CASTLE.

bright seaport town where wood is king. Huge barges laden with sawn wood or pit props crowd the harbour, and much of the wood finds its way to this country. The forests of Finland are slowly vanishing into the bowels of our land. Hundreds of miles of dark tunnels in our coal mines are supported by the timber which Finland's granite-strewn soil has nurtured. Viborg's chief landmark is an ancient shot-marked castle, from the summit of which one looks over league after league of lake and forest. We arrived at Viborg between eight and nine in the evening; yet in this summer land of almost perpetual daylight there was ample opportunity to take a drosky and drive to the delightful sylvan retreat known as Mon Repos. Here we found magnificent trees, devious paths that strayed into the very heart of a noble forest, craggy heights crowned with towers and summer houses, lovely little backwaters fringed with reeds, and above and beyond all a sunset such as Nature only dares to paint. It seemed as if she had dashed her palette of ineffable colour against the broad canvas of the sky in a very riot of ecstasy. Mon Repos is happily named: the spirit of the lotos-eaters permeates the place.

At the quays beneath the shadow of Viborg's ancient castle lie the beautiful white steamers which navigate that great congeries of lakes known as the Saima. This vast inland sea covers some 5,000 square miles, and on it one may sail for days at a time in a perfect fairy realm of island-studded, tree-girt waters. The favourite tourist trip is to Nyslott, a picturesque village with the most perfect castle left in Finland. The ruin stands on a rocky islet around which the waters rush and eddy ceaselessly. Thence the traveller proceeds to Punkaharju, one of the most extraordinary natural wonders in this extraordinary land. Punkaharju is a moraine which forms a broken rampart of rock uniting four or five little islands. This tongue of land is about five miles long, and nowhere is it more than three hundred yards wide. The ridge is a hog's back, wonderfully wooded and fretted with promontory, creek, and bay, affording numberless pictures of serene beauty. Punkaharju has a reputation, and fully deserves it.

The enterprising push on to Kuopio, the most picturesquely situated town of the whole duchy. It has actually a hill, from the summit of which the view beggars description. From Kuopio the ardent angler or sportsman takes the newly-finished railway to Iisalmi, and drives across rutty roads to Kajana, where the waters abound in grayling and trout, and the fish positively ask to be caught. A fifty-pound salmon was actually landed here in 1884. There is abundance of wild-fowl shooting, too, from the middle of August to December.

From Kajana a steamer crosses the lake to Vaala, from which place the rapids of the Ulea are shot in a tar-boat. The experience is exciting enough, so I am told, but it is a joy I have yet to taste. So much for the Saima, which might well occupy a whole holiday, and leave the tourist, like Oliver Twist, asking for more.

Let us now return to Viborg, and pay a visit to far-famed Imatra. To leave Finland without seeing Imatra would be equivalent to quitting London without visiting Westminster Abbey or St. Paul's. The little steamer leaves Viborg at nine in the morning, and for an hour or two sails up the broad fiord towards the Saima Canal. Until the year 1856 the Saima had no outlet to the Gulf of Finland. Countless streams carried its overflowing waters to Lake Ladoga, and all the wealth of its forest girdle found its way to the Neva. Now, however, the cluster of lakes lying between the Saima and the fiord of Viborg are united by a two-hundred-mile canal, which is traversed by thousands of vessels every year, all bearing the growth of the forests to the open sea.

I do not know anything more enjoyable than a sail up this canal on a fine day. There is not an unpicturesque or uninteresting view the whole way. You sail through waters so exquisitely clear, so wonderfully still, that it is hard to say where land ends and water begins. The wash of your steamer sets the water-lilies nodding and laves the boughs of the overhanging trees. You want to spend a week at every stopping-place. Beautiful summer residences peep out of the foliage; canoes with white-clad youths and maidens vanish into the entrancing labyrinths of the side creeks; the very timber barges have an air of romance.

The Rättijärvi Lake, where one leaves the steamer to drive to Imatra, is perhaps the gem of all. Twenty odd miles of country now lie between us and the cascade we have come so far to see. Mile after mile the road winds between dense forests; signs of habitation

A REST BY THE WAY.

are few and far between. For certainly half the distance we did not see a soul. The road is rough, and the drosky plays cup-and-ball with us, and does not

catch us fairly every time. As the hardy Finnish horse dashes down a steep road towards a primitive bridge consisting of a few tree-trunks thrown across a stream, we cling to one another and think of the children at home. But our stolid driver never turns a hair; he falls asleep during the hot afternoon. But his knowing horse wants no guidance; it walks up the slopes of the undulating road and dashes down the steep pitches entirely "on its own." It even pulls up at a roadside well when it wants a drink. The Finnish well and the Egyptian shadûf are akin. Each has a lever-like pole weighted at one end, so that the bucket is drawn up without the labour of the windlass.

Now we pause at a roadside farm to change horses, and out run the farmer's six white-headed little lads laden with curios for sale. Anon we pass a little village and see the school. It is holiday-time; the classes do not meet during the brief but precious summer months, and the master is away, probably taking a holiday course at Helsingfors or Sordavala. I visited a school in North Finland, but it also was empty, and the grass had grown long in the playground. The schoolroom itself was large and airy, beautifully clean and freshly painted. Over the doorway was an oleo-

THE CASCADE OF IMATRA.

graph portrait of the Czar, to whose counterfeit presentment, no doubt, due obeisance is exacted, but for whose personality the Finnish child has none of the awe-stricken veneration that obtains in Russia itself. The maps were all hung upon a frame, and each could be let down at will in the sight of the whole school. In an outhouse was the wood-working department—a feature of all Finnish schools. The sloyd work which I saw was admirable.

The master's house was large and airy, and was adorned with highly patriotic Finnish mottoes. The Finnish schoolmasters are the last bulwark of Finnish nationalism.

I was interested to know how the schoolmasters were paid, and my inquiries at last were satisfied. In a neighbouring parish a new dominie was being appointed, and his annual emoluments were displayed at length in the columns of the local newspaper. They were as follows:—"7 hectolitres of rye; 7 hectolitres of barley; 2,125 kilos. of hay; 2,125 kilos. of straw. Residence, wood, and light (all provided by the locality); together with 800 marks (or about £33, 6s. 8d.) from the state." As I do not know the current prices of the farm produce mentioned above, I cannot estimate the total salary, but I should say that it was sufficient to keep a man in an out-of-the-way Finnish village in a condition of tolerable comfort.

We arrived at last at Imatra, and put up at a vast caravansary overlooking the cascade. It was under Russian proprietorship, and evidently was a favourite resort for St. Petersburgers. The military element predominated, and every officer wore his heavy gray overcoat, despite the heat. I think a Russian officer would rather part with his life than with his overcoat. I am told that he wears it for warmth in winter and for coolness in summer.

Many capable pens have tried to do justice to Imatra, and as all have failed, I shall be in excellent company. Imatra is not a waterfall; it challenges no comparison with Niagara; its bed falls only sixty feet in a thousand yards: yet the only epithet to apply to it is—tremendous. The broad Vuoksi River, uniting the Saima with Lake Ladoga, suddenly contracts into a funnel-shaped trough fifty yards wide, and through this the roaring, tearing flood leaps and surges in mountainous masses of foam, more than 60,000 cubic feet of water flashing past every minute.

A granite, tree-fringed gorge, a furious torrent—that is all, yet the fascination of it is almost overpowering. The thunder of the waters is deafening; the leaping, hissing spray is iridescent with rainbow colours; the avalanche of water, tawny green below, the purest white above, is hurled along with titanic force. You watch and watch and cannot take your eyes away. You get down on the rocks within arm's length of the weltering tumult, and soon the awful power of it overmasters you. What are you, vain man, that you should boast? What is your strength to this?—what your boasted intellect, your skill, your ingenuity, your mastery of nature? A bubble on the river, a fleck of foam on the torrent, a drop of spray on the leaf. Beside Nature's cataclysms you are but a speck of animated dust; your very powers of destruction—the mightiest of all your powers—are ridiculous, the puny wrestling of a sick infant! And yet—and yet fish have been caught battling in the very centre of this mighty, overwhelming, swirling embodiment of brute force. Thus does man, with the indomitable germ in him, struggle and yearn, fight and succumb, and yet sway the unconquerable monster to his purposes, though ever the sport of its wanton, implacable rage.

To recover your equanimity, and incidentally your self-confidence, you must visit the lower fall of Vallinkoski. The scene is more picturesque, The torrent has lost its first fury; it pleases and charms: but once and again you return to Imatra, and abase yourself before its immensity.

And here I must conclude. There are many more beautiful lands, many richer in natural gifts, in the treasures of art and worship, but there is no land that I know of where one comes so closely in contact with Nature in her elemental moods. The mysterious forest, the roaring cascade, the swirling river, the wave-washed crag, the spreading lake, the rock-cumbered land, the toiling peasant making patient headway against the forces of stern Nature and political reaction—these are the lingering memories one carries away from beautiful, unhappy Finland.

EDUCATION ON THE CONTINENT.

GERMAN teachers have lately been holding their annual congress in Königsberg. The question of the organisation and co-ordination of various grades of schools was one of the most important subjects debated. The most drastic solution of the problem was that proposed by the Hamburg teachers, who argued for placing every grade of school, from the elementary school to the university, under popular control and support. Secondary and higher education, it was argued, should no longer be restricted to the classes, but should be opened in the widest possible measure to the masses.

The proposition, which was not accepted, was met by both flank and direct attack. Those who would have none of it at any price stigmatised the motion as socialistic in tendency, whilst others were willing to accept so much of it as would have made the *Volkschule* the preparatory school for all ranks of society, and thus have abolished class distinctions so far as the lowest stages of education were concerned.

As a natural corollary to the idea of the *Allgemeine Volkschule*, in the broad sense of placing education from the base to the apex under popular control and support, our Hamburg brethren desired that in every grade of school no payments should be exacted either for fees or for school material. Another essential result of the change proposed would be the unification of the teaching body. The motion is for the present dead, but it may crop up again.

An obscure school district in Switzerland has lately realised one of the ideals of the Hamburg teachers. In Bellinzona no charge is made for books and other school materials in schools of any grade.

That the national feeling in Hungary is strong is well known to all who study Continental politics. The common language is the factor which, more than any other, cements the national sentiment, and the politicians of Hungary employ every effort to spread its use. A Bill lies now before the Hungarian Parliament which proposes to make Magyar the principal language in all elementary schools, of whatever nationality the scholars may be. Teachers who do not attain a sufficient degree of success in teaching the national language may by this Bill be dismissed.

Prussia, too, realises the indissoluble connection between national sentiment and the possession of a common language. A Bill has been introduced into the Prussian Diet to make attendance at continuation schools compulsory in the rural districts of Hesse-Nassau. This has moved the Governor-General of Posen to ask the opinion of the governments of Bromberg and Posen whether a similar Bill might not suitably be introduced for the province of Posen also. Such a measure, it is thought, would aid in the Germanisation of the Poles of Prussia, by giving children who have left the elementary schools an opportunity of perfecting their German.

The lady teachers in Berlin set a good example of educational enthusiasm to their English sisters. Some of them organised a meeting of mothers of scholars for the purpose of interesting them in the question of continuation schools. This novel kind of mothers' meeting was attended by a couple of hundred parents, and it was so successful that it was resolved by acclamation to make it the first of a series of similar meetings.

Imitation is said to be the sincerest form of flattery. This practical form of flattery has been applied to some of our educational institutions. The English public school has been the object of careful study by the new generation of Frenchmen who have done so much to make our institutions understood on their side of the Channel. Eton and Winchester have been taken as models for similar institutions in France. In Russia, at Tsarskoe-Selo, there is, we believe, also a school worked on English lines, so far as these can be applied in a country where the conditions differ so much from those prevailing in Western Europe. It is now the turn of our mechanics' institutes and working-men's colleges to be put forward as patterns for imitation.

One of the leading Social Democratic papers of Germany calls attention to the comparative failure of the institutions organised by the party for the further education of its workers. Their reorganisation on the lines of our working-men's colleges would result in the creation of a newer race of industrial leaders, possessing deeper culture, and able to take a more dispassionate, because a wider, view of political and social problems. That has been the case in England, where class distinctions are not so sharply marked as in Germany, and where differences in political feeling are accompanied by a more thorough understanding of the case of the other side. Voluntary institutions of the nature of mechanics' institutes have made it easier in England than in Germany for a workman to rise to the position of master. This fact would perhaps not be a recommendation in the eyes of the German Social Democrats, but it undoubtedly tends to lessen the feeling of social injustice which has done so much to increase the socialist following in Germany. Many difficulties exist in the way of founding in Germany institutions like those mentioned, but the fact that the movement for the creation of *Frauengymnasien* has made such headway, despite the cold water thrown on it at first, should not be forgotten.

In Holland the question of state support of denominational schools threatens again to become a disturbing factor in educational politics. It is proposed largely to increase the additional assistance given these schools by the Act of 1901. This proposition has evoked much bitter feeling in Holland, and the friends of the public schools protest vigorously against it.

In one particular respect the contest now raging differs from that which our Education Act of 1902 excited. Teachers and school inspectors have taken sides for and against the proposed amendment of the law. A journal edited by a school inspector characterises the public (undenominational) school as a product basely begotten from a union between the principles of the French Revolution and of the old Dutch liberties. The school of the Reformed Church is, according to this journal, the legitimate child, born in the most glorious period of Dutch history, when Calvinism set its mark on the conduct of public affairs in Holland.

Fear awakened by the growing influence of socialism counts for much in the desire to exalt the denominational at the expense of the undenominational school. Anti-revolutionaries and Roman Catholics, once the bitterest of enemies, are now united in claiming increased support for denominational schools. The coalesced parties describe the undenominational schools as hotbeds of socialism, nurseries of corruption, and godless. The zeal of the defenders of the denominational schools oftentimes overshoots the mark. It is urged that an instruc-

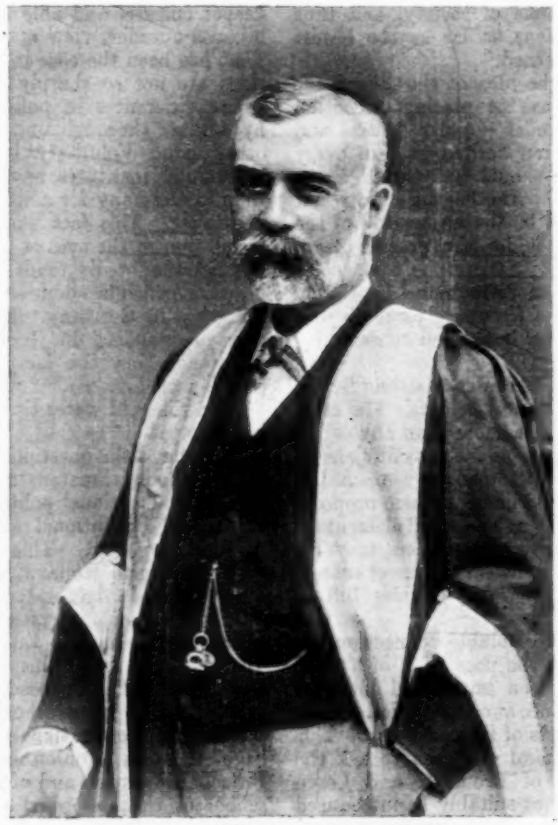
tion so largely based on intuition, rejecting dogmatic statements, and demanding that the senses shall play their part in the acquirement of knowledge, must be subversive of belief in revealed religion.

The English teacher is, in one respect, at a disadvantage as compared with his Continental *confrère*. For him there exists but a slight possibility of receiving any State distinction. In accordance with a law lately passed by the French Chambers, fifty crosses of the Legion of Honour are to be allotted to teachers in primary schools.

THE LATE THOMAS A. STEWART, M.A., LL.D.,

H.M. Chief Inspector of Schools.

THE news of the death of Dr. T. A. Stewart, His Majesty's Senior Chief Inspector of Schools in Scotland and Inspector of Training Colleges, will be received with universal feelings of regret by teachers and educationists throughout Scotland. For the last two years he has been more or less laid aside by a painful malady, but many of us had hoped that he would soon be restored to health. It is but a few weeks since he hopefully wrote to one of his colleagues saying that he felt perceptibly better, and that he thought he would be able to resume his work during the coming winter. But that was not to be so, and Scottish education to-day mourns the loss of one who has done much, both officially and privately, to promote its highest interests.



Thomas A. Stewart, M.A., LL.D.

Dr. Stewart was born in 1846 in Grantown-on-Spey, where he received the early part of his education. He then proceeded to Edinburgh Academy, and afterwards to the famous Grammar School of Aberdeen, where so many of Scotland's great educationists have been trained. This latter institution he left as dux of the school in 1863. In due course he entered the University of Aberdeen, where he had a most distinguished career. On graduating he gained the Simpson Greek prize of £70 and the Town Council Gold Medal. Immediately after graduation he carried off the blue ribbon of Scottish scholarship—the Fullarton Scholarship in classics and mental philosophy.

From 1868–69 Dr. Stewart acted as interim rector of the Aberdeen Grammar School, and subsequently became assistant professor of Greek in the university of that city. On the reorganisation of George Watson's College for Boys, Edinburgh, he was appointed senior classical master. All this was merely introductory to his life-work, however; for in 1874 he received an appointment as inspector, beginning his duties in Edinburgh under Dr. C. E. Wilson. Next year he was transferred to the Banffshire and Orkney district, where he won golden opinions for his sound work. In 1886 he was removed to the Midlothian and East Lothian District; and here his admirable work gained for him more speedy promotion than usual, for in 1888 he was appointed to the chief inspectorship of the Northern Division. During his work in Aberdeen he received the degree of LL.D. at the hands of his much-loved university.

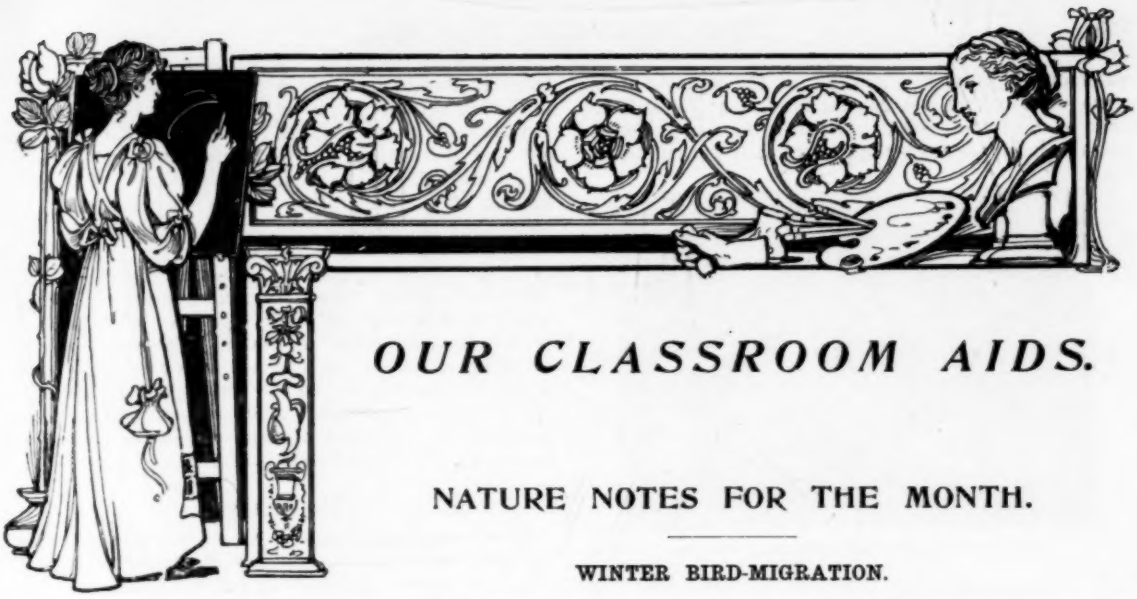
On Dr. R. Ogilvie's transference from the Western Division, Dr. Stewart was elected to take up this important work; and on the death of Dr. Ogilvie, in 1899, he reached the highest position of the Scottish Inspectorate—Senior Chief Inspector of Scotland and Inspector of Training Colleges.

While performing his duties as inspector, Dr. Stewart found time to publish two very popular Greek courses and a translation of the odes of Horace. He also acted as examiner for degrees in classics in Aberdeen University.

His other works, are they not found in the Parliamentary Blue-books? His facility and felicity of expression, his lucidity of manner, his careful attention to details, light up the somewhat dry reading that is usually associated with these latter volumes. He was in all things distinguished by great force of character. His kindliness and evident sympathy, his urbanity and judiciousness, his love of truth and fair dealing, his intimate knowledge of child nature, endeared him to the great army of teachers and scholars with whom, during his thirty years of official life, he came into contact. There can be little doubt that many of the modern tendencies in education were not all to his liking, yet his loyalty to the Department never swerved.

His clearness of vision rendered him able to discriminate with great precision and fairness—almost intuition—the work he had to inspect, and while he was frank and generous, nevertheless it was felt by all that he would not tolerate anything that savoured of pretension. His whole interest was centred in his official duties, which to him were both work and recreation; for he followed no outdoor pursuit, and was a member of no club. Music was, perhaps, his only recreation. The teachers of Scotland will miss in him a sympathetic inspector, his colleagues a guide, philosopher, and friend, and the Department a virile and capable administrator.

R. D.



OUR CLASSROOM AIDS.

NATURE NOTES FOR THE MONTH.

WINTER BIRD-MIGRATION.

FROM the earliest times the regularity of the movements of certain of the feathered tribe has excited universal and widespread interest. Many of the old writers refer to the movements of the swallow. The patient Job was evidently struck by the phenomenon, for in his book we find mention of the "hawk that spreadeth her wings toward the south."

At the present day the subject of bird migration is not devoid of interest, in spite of its antiquity; in fact it is constantly recurring in our literature in a more or less direct form.

At school the child's interest is aroused by the exploits of that famous traveller the cuckoo, as set forth in the class reader. Odes and songs descriptive of the return of spring would be considered incomplete unless the swallow was mentioned.

Every country schoolboy knows the fieldfare or "felt," which is so conspicuous in the snow-covered fields and hedges during the Christmas holidays, but the most enthusiastic collector never succeeds in adding the bird's egg to his collection. Doubtless he will be delighted if his mentor can supply him with any information concerning this mysterious bird.

Migrants and Migration.

Birds may be divided into two sections—(*a*) residents, (*b*) non-residents or migrants.

The residents are birds of sedentary habits; they have no ambition to leave their native country, apparently preferring to stay at home in the vicinity of their birthplace. Throughout the summer the sparrow chokes the water-pipes with a miscellaneous collection of odds and ends commonly known as a nest, and in the winter he may be seen feasting on the provender provided for the domestic animals. The sparrow is a resident. So, too, are the blackbirds, greenfinches, hedge-sparrows, and other interesting birds.

The Migrants.—Coming to the non-residents, we have birds such as the swallow, nightingale, and flycatcher, which arrive in April, breed, and subsequently depart again in autumn. They are absent for at least five months of the year, hence they cannot strictly be termed residents, though they actually breed in this country. Birds which periodically come and go are "migrants," and their journeyings are "migrations."

Migrants are of two kinds—(1) summer, (2) winter migrants.

Under the first heading come the swallow, cuckoo, and

THE SWALLOW, A SUMMER VISITOR.

the numerous members of the warbler family, interesting birds whose habits are best described in the proper season.

Winter Migrants.

Towards the middle of October, when the majority of the summer migrants have departed southward, the numbers of the residents are augmented by a great influx of birds from the northern regions. It is popularly supposed that these birds have been driven to take refuge on our shores by the severity of the weather conditions prevailing in their native haunts; but this supposition is only half true, for birds in general are not very susceptible to the effects of low temperature. The real cause of the invasion is the failure of the food supply.

Summer in the arctic and sub-arctic regions ends with August. At this period the severe northern winter sets in, locking both land and water with icy grip. The finches and insect-eaters are no longer able to procure a living from the snow-covered earth, and the iron-bound

watercourses repel the hardiest of the aquatic birds; consequently there is a general movement towards the more open districts—that is, south. As the winter extends its influence, the birds are gradually pushed further

THE BRAMBLE-FINCH, A WINTER VISITOR.

and further away from their homes, until they ultimately arrive in the temperate zone.

The first invasion of the British Isles takes place in the end of September and the beginning of October, and consists of insectivorous birds from North Europe, such as the swallow, willow-wren, etc. These make but a short stay, hurrying through the country towards the south coast, to join their home-bred kin, many of whom are already on their way to Africa.

Later on in October the hardier birds begin to arrive, and the districts round the east coast are unduly crowded with rooks, starlings, hooded crows, fieldfares, and bramblings. These are the winter migrants.

They are quite capable of existing under the conditions afforded by our comparatively mild winter, so naturally they go no further, but scatter themselves over the country, to fraternise with the residents for a period of five months. Large numbers of snipe, plovers, ducks, and other aquatic birds also reach the coast. Open waters and running streams are always to be found in this country, even in the severest of winters; hence the waders and swimmers are tempted to stay, much to the delight of the sportsman.

THE KNOT.
(By permission of the Stepney Boro' Museum.)

There are, however, a few restless individuals amongst the ranks of the shore birds. The knot and the turnstone, for example, make no prolonged stay, but wander leisurely down the various coasts of the Old World, until they actually arrive in the antarctic regions!

Because it *passes* England *en route*, the knot is termed a "bird of passage," and its journey from pole to pole is an instance of "extended migration." The knot figuring in the illustration has been mounted so as to show the long, pointed wing, which is a characteristic of birds of extended flight.

On the return of spring the winter migrants depart northwards again. The arctic winter does not end before May, consequently, in their eagerness to reach their breeding-places, many of the birds arrive before the breaking up of the ice, and are thus reluctantly compelled to retreat again to the fringing area. Seebohm, the great bird authority, gives a most interesting description of the return of the birds in the account of his expedition to the Petchora district.

The Journey.

The annual pilgrimage is no slight undertaking for the long-winged birds, much less the weaker birds with short, rounded pinions. Moreover, the journey is fraught with considerable danger. It is not surprising, therefore, to find that the migrants habitually use certain well-defined routes in preference to others which their hereditary instincts inform them have been fatal to their ancestors. To guard against the possibilities of exhaustion, the travellers work their way towards their desired havens in short, easy stages, resting wherever the surrounding circumstances are favourable, and carefully avoiding long flights.

The two favourite bird-routes are (*a*) the sea coast, (*b*) the river valleys.

If we look at the map of Europe we notice that the general direction of both the coast and the large rivers is, roughly speaking, south, hence it follows that the birds have a series of fine natural highways at their disposal, all leading in the correct direction.

The aquatic birds, particularly the marine species, follow these routes from sheer necessity; their existence depends on the presence of water. The land birds would naturally be attracted from the surrounding country by the abundant supply of food to be found in the fertile river valleys and on the sea shores.

Many of our winter migrants come from Scandinavia, Lapland, and the tundras of North Russia. In the course of their journey they must necessarily strike the western coast line. When this happens the migratory stream is deflected into one of the coast routes.

The birds enter this country at two chief points—(*a*) the Shetlands, (*b*) the coast of Norfolk.

The Shetland route is largely patronised by the hardy aquatic birds, which strike across from the Scandinavian mainland, using the intervening islands as a temporary resting-place.

The main body, however, continues down the shores of Norway, across the Skager Rack, to the base of the Jutland Peninsula, where it meets the arrivals which have travelled from the inland districts *via* the Baltic coast. The two streams unite to form a larger one, but subsequently branch off in two directions. One branch continues down the coast to populate the south of Europe, the other stream supplies England with its winter visitors. The North Sea at this point is comparatively narrow, and contains numerous small islands and projecting capes, which greatly assist the travellers in their journey to the east coast of Britain. Heligoland is a favourite stopping-place for the short-winged birds.

Herr Gatke, a famous German ornithologist, spent the greater portion of his life on this island, for the purpose of observing the phenomenon of migration.

In their passage over the sea, the keen-sighted birds travel at great heights, in order that they may be able to view a greater area, and so distinguish the various landmarks and alighting-places. Amongst the travellers are numerous old birds, who have performed the journey in previous years. Doubtless these veterans guide the novices who are migrating for the first time.

In spite of their precautions, large numbers of birds

PLAN OF THE ANNUAL WINTER INVASION.
(Showing the homes of the invaders and the routes by which they travel.)

lose their way, or fall victims to fatigue. During stormy weather, for instance, we are sometimes visited by stragglers from the north-east of Asia, birds which in the ordinary course of events would have wintered in Burma and China. The short-winged birds are often compelled to alight on ships in order to recruit their strength, otherwise they fall into the sea and perish.

When the migrants reach the east coast of England, they are usually in a more or less exhausted condition, consequently, for the time being, they are indisposed to continue their journey.

This is one of the reasons why the projecting headland of East Anglia is such a favourite locality with the sportsman and naturalist.

In next month's issue I hope to conclude this subject with a few notes and observations gathered in the London district and elsewhere, giving localities if convenient.

Books recommended for detailed study.—Dixon's *Migration of Birds*; Headley's *Structure and Life of Birds*.

(*To be continued.*)

THE NEW CODE: A CORRECTION.—In Schedule I. of the New Code it states that a pass at the Edinburgh University Local Examination for Senior Certificate will suffice in place of a pass at the King's Scholarship Examination.

The following letter we have received from the Clerk to the University shows the absurdity of this misleading regulation:—

"In reply to your letter of yesterday, I have to state that the Local Examinations have been discontinued for some years."

P. LYDDON-ROBERTS AND E. F. DENNEY,
Principals Normal Corr. College.

NOTES OF LESSONS ON WINTER IN THE WOODS.

Class.—The lessons are suitable for the elder children in either rural or urban schools.

Time.—Three or four lessons of thirty minutes each.

Object.—To interest the children in the study of nature, by showing them the marvellous manner in which instinct leads the denizens of the woods to prepare for the dreary winter months.

Step I. Preparation. — Let the children write as a composition exercise a short description of the woods in winter-time, and even the most unobservant of them will be able to set down some fact about the change that comes over woodland life during that season which will serve as a text for a short lesson that may possibly stimulate the child to take a keener interest in the world around him.

Perhaps the most striking feature of the woods during winter is their stillness.

"'Tis as the general pulse
Of life stood still and Nature made a pause."

The hum of the insects is no longer heard, the birds have hushed their songs, while the bare and leafless state of the trees forces on our notice the absence of those happy creatures that disported themselves in the pleasant sylvan shade during the summer months. Having discussed the altered appearance of the woods, let us look for the reasons for the change, and endeavour to ascertain how Nature enables her children to meet the rigour of winter.

Step II. Presentation. 1. *The Trees.*—In our lesson on leaves we saw that the trees obtained their supply of carbon through their leaves, which in the sunlight are able to break up the carbonic acid gas in the atmosphere, setting free the oxygen and retaining the carbon. During winter, however, there is so little sunlight that the supply of carbon is insufficient to maintain the active growth that obtains through the summer; so Nature has arranged that the building-up process shall cease during the winter; and, as the leaves have no work to do, they fall from the tree. Now, how do the leaves fall? If we pluck a leaf from a tree, we leave a wound behind; and if we strip a tree of its leaves, we shall probably kill it. How, then, does Nature strip the trees without injuring them? Just at the junction of the leaf there is a ring of cells round the midrib; these cells are empty during the summer, but when autumn comes they begin to fill, and increase inwards until they effectually choke up the vessels of the stalk. Being now cut off from the tree, the leaf dies off, and the first sign is the change that comes over the green matter of the leaf, which turns to one of those gorgeous tints that make our woods so beautiful in autumn—the rich brown of the beeches, the purple of the mountain ash, or the red of the maple; or if these are unknown to the children in the towns, the beautiful crimson of the Virginia creeper, at least, is familiar to them.

2. *The Birds.*—We have already seen that many birds migrate to warmer climes when the weather gets cold and the supply of seeds and insects begins to fail. This affords the young nature-student an opportunity of exercising his powers of observation by keeping a record of the times of arrival and departure of the different birds of passage.

3. *The Mammals.*—Mammals are not capable of performing such long journeys, or of crossing natural bar-

riers such as seas and mountains, as the birds are, and so they are unable to migrate to warmer climes during winter. Nature has, therefore, endowed many animals with the power of sleeping through the winter. The thoughtful child may ask why the animal does not die of starvation if it goes for months without food. Let us consider for a moment why we take food. There are many points in which a living animal resembles a steam-engine. In order to make the engine move, it must be supplied with fuel; and the faster the engine goes, the more fuel is consumed. If the engine is not required for a little while, the driver "banks up" the fire with ashes, so that it will burn as slowly as possible without going right out, and thus consume the minimum amount of fuel. Food to an animal is like fuel to the furnace, and the more the animal moves the more food it requires. Our own bodies supply us with ample proof of this. Why do we come back with such a good appetite after a long walk? Simply because, in order to make that extra exertion, we have had to maintain a bigger "fire," and so more food is required. When we are asleep our bodies are at rest, and so our "fire" burns very slowly: so that a boy can go to bed at eight p.m. and get up at seven o'clock the next morning, thus going eleven hours without food without any inconvenience; but if he went without food for eleven hours during the day, he would get quite faint with hunger.

Now let us see how this principle applies to the animals in the woods. During the summer they found a plentiful supply of food, and so were able to frisk and gambol to their hearts' content; but in the winter food is so scarce that they cannot keep going, like an engine, at full speed, as they cannot obtain sufficient fuel, and so they keep as still as possible—in fact, many of them find a sheltered spot and sleep out the winter. This is called "hibernation"—a name that means passing the winter. Hibernating animals get very fat and plump during the summer, and while they are sleeping the fat serves as a stock of "fuel" to keep them alive, so that when they come out in the spring they are quite thin.

Let us now consider a few of these animals and their habits. First of all we have our friend the squirrel. Every one knows this merry little fellow with his reddish-brown coat and his bushy tail, and those who are familiar with him in his native wood know how well the colour of his coat harmonises with the colour of the tree-trunks, and so helps him to escape detection. Even his bushy tail is not without its use. By its help he is able to leap down from a considerable height without hurting himself; for he spreads out his bushy tail, which acts like a parachute, and serves to break his fall. The squirrel feeds on nuts, acorns, fruit, and seeds; and as the wise little creature knows that these will fail during the winter, he lays up a store in the nooks and holes near the tree in which he has made his nest. What a wonderful memory the squirrel must have! for he never seems to forget these hiding-places; and should he wake up during the winter, he is able to go straight to one of his storehouses and make a meal. His nest is generally in the fork of a lofty branch, and is always placed so as to be out of sight from the ground. Sometimes it is placed in a hollow trunk or a decayed bough, but the animal always shows the same ingenuity in concealing it. The nest is almost spherical in shape, and is made of leaves, moss, and grass, so cleverly woven together that it is quite rainproof. It is always securely fastened to the tree, so that it cannot be dislodged by the wind.

The pretty little dormouse, as its name implies, is also a sleeper. This animal is not so often seen as the squirrel, because it passes the whole day in its nest, and only comes out towards sunset, when it scampers about the trees, leaping from bough to bough with surprising agility. Its nest is neatly constructed of grass and leaves, and has the entrance at the side. The food of the dormouse consists of acorns, nuts, haws, etc.; and, like the squirrel, it provides for the winter by laying up a store. Like all hibernating animals, the dormouse gets very fat towards the end of autumn, and when the cold weather sets in it retires to its winter quarters. If, however, there should be a spell of mild weather, the dormouse will rouse itself and visit its store for nourishment; but when the cold returns, it again sinks to its former lethargy.

The tiny little harvest-mouse also sleeps the greater part of the winter, but not so soundly as the dormouse. During the summer it lives in an elegant little nest built of hair, wool, moss, etc., hanging between grass-stems or wheat-straws. It knows that this nest is too fragile to last during the winter, so it prepares a burrow in the ground, laying up in it a store of grain, and here it passes the winter, mostly in slumber.

The hedgehog is one of the soundest sleepers that we have. When winter comes on he seeks some sheltered spot, such as a hollow tree or the gnarled roots of an old tree, or even buries himself under dead leaves and moss, and here he sleeps through the whole winter without a break in his slumbers. Nor is the reason for this far to seek. The other animals we have mentioned lay up a winter store, but the hedgehog lives on grubs, insects, worms, etc., which of course cannot be stored; consequently, should the hedgehog by any chance wake, he must turn over and go to sleep again, for he has no store to visit if he comes out of his hiding-place.

Bats pass the greater part of the winter in sleep, retiring into old buildings or hollow trees, where they hang head downwards until the insects emerge from the pupa state in which most of them pass the winter.

The snail makes himself very snug within his house in a very remarkable manner. By means of the slime which he secretes he covers himself with dead leaves and moss; then he closes up his shell with a lid formed of hardened slime, which keeps out all intruders; but he does not forget to leave a little hole in the lid for ventilation.

Step III. Association.—Having taken the familiar hibernating animals of our own woods, we might associate with these a few foreign animals. Both the brown and the black bear hibernate in hollow trees, caves, or even holes in the ground. The polar bear is well provided against the cold, but we find the female always buries herself completely in the snow in order to rear her cubs. The hamster is probably the soundest sleeper in the world. This little animal, which is found in Germany, belongs to the mouse tribe, and so soundly does it sleep that even an electric shock has failed to wake it.

Another point for association is the similarity between the hibernating animals, which subsist during their winter sleep on the fat they have acquired during the summer, and those animals, such as the camel and some Indian cattle, which are provided with a store of fat in the form of a hump, on which they subsist when they are unable to obtain food.

Step IV. Formulation. 1. *Trees.*—The growth ceases during winter; so the leaves fall.

2. *Birds.*—Many of them fly to warmer climes.

3. *Mammals.*—May be compared to engines. Much motion requires a lot of fuel or food. When there is a scarcity of fuel or food little motion is possible, hence many mammals hibernate. The best known of these are the squirrel, the dormouse, the harvest-mouse, the hedgehog, the bat, and the snail.

The camel subsists on his hump when he cannot obtain food.

Step V. Application.—Surely the sight of these tiny animals laying up for themselves a store of food to carry them over the time when food cannot be readily obtained should prove a very valuable lesson on the necessity of thrift.

NOTES ON AN EXPERIMENTAL COURSE OF LESSONS ON AIR AND WATER.

BY EDWARD J. RUSSELL, D.SC. (LOND.),
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(*Continued from p. 134.*)

Experiment 11.—A very pretty variant on Experiments 9 and 10 is obtained by using soap bubbles instead of balloons. Blow a bubble with the breath: the bubble sinks, as the breath when cold is heavier than air. Next blow a bubble with coal gas: this will rise, and may be ignited with beautiful results as it goes upwards.

Good soap bubbles are really hard to make, unless special precautions are adopted. The following method is very reliable:—

Five grams of sodium oleate (costs about 4d. per oz.) are dissolved in 200 c.c. of distilled water without warming, 50 c.c. of pure glycerine are added; the mixture is well shaken, and then kept in the dark. After a week, siphon or decant off the clear liquid into the bottle in which it is to be stored, and add a drop (not more) of strong ammonia solution. The mixture keeps indefinitely, but it must not be shaken or exposed to light.

In doing the experiment, pour a little of the soap solution into a *perfectly clean* small dish, and blow the bubble on a clean glass tube of about 30 mm. diameter. After a little practice, large and stable bubbles can be obtained either from breath or coal gas.

Experiment 12.—If a gas is lighter than air, it must be poured upwards when transferred from vessel to vessel; if heavier, pour downwards.

Take two gas jars of equal size, and fill one with coal gas. This is readily done by fixing a rubber tube on to the gas-pipe, passing the other end to the bottom of the jar, and then holding the jar upside down. In a few moments the smell of gas indicates that the jar is full. Then invert the other jar and gently pour the gas into it. Apply a light to both jars. The one that was full is now empty; in the other a flame or a slight explosion is obtained.

Experiment 13.—Fill one jar with carbonic acid (see Experiment 10, p. 134), standing the jar the right way up and delivering the gas to the bottom. Ascertain when the jar is full by putting in a lighted taper. Then pour downwards into the other jar, and test both with a lighted taper.

Pressure of the Air.

If air is confined in a vessel, it pushes against the sides and tends to escape. A push is called a pressure. In common parlance one speaks of the pressure as being due to the weight of the air. This view is very incomplete, however, and does not explain why the total pressure a volume of air can produce depends not on its volume but on its surface. It is more correct to say that the weight of the air above a given surface regulates the pressure on that surface.

Air is made up of a number of extremely small particles moving with high speeds. Although the particles are very minute—it would take millions of them to make an inch—their number is so enormous that the effect they produce in bombarding a surface is quite considerable. This bombardment is the real cause of the pressure of the air.

Experiment 14.—Fill a tumbler with water, put a piece of paper on the top, and invert. The pressure of the air helps to keep the paper in position, and prevents the water falling out.

Experiment 15.—Boil some water in a tin can, cork tightly, plunge into cold water. The air is expelled from the can by steam, which, however, exerts the same pressure inside as the air does outside, so that the can is unaffected. But when the steam condenses it no longer counterbalances the pressure of the air, and the can collapses. It may be necessary to wait four or five minutes for this result.

Be careful not to instance a boy's sucker as a case of atmospheric pressure. This ancient "howler" was exposed years ago (for example, in Tait's *Properties of Matter*), yet it periodically turns up in books intended for teachers. The boy's sucker works just as well *in vacuo* as in the air; its action is due to the surface tension of the film of water.

For the next few experiments an air-pump is required. This can be obtained for 25s. or less if supplied with a brass nipple instead of the ordinary brass plate. The plate is costly and unnecessary, and in any case a nipple is wanted in order to connect the pump with the experimental vessels.

Experiment 16.—Pump air from a thin-walled flat-bottomed flask which has been in use some time. The flask will usually break. If an old one is not to hand, weaken a new one by heating strong caustic soda in it for twenty-four hours.

A can made of very thin tin, or a square glass flask (the "breaking square" of the instrument dealer), will collapse with certainty.

Experiment 17.—Tie a piece of sheet india-rubber over a lamp chimney or wide glass tube, making the joint air-tight with Faraday's cement. Connect the other end to the air-pump, again applying cement to prevent leakage. The pressure of air inside the tube is equal to that outside, and the india-rubber remains stationary. Work the pump. The number of particles of air inside is diminished, and consequently also the internal pressure. The india-rubber is therefore driven inwards.

Faraday's cement is made by melting together five parts by weight of resin and one part of yellow beeswax, and gradually stirring in one part of Venetian red (finely powdered dry ferric oxide). Continue to heat and stir for some time. When required for use, the cement is melted, and applied with a glass rod. The surfaces must be clean and dry. The joints obtained in this way are perfectly air and water tight, though organic solvents (benzene, etc.) dissolve the cement.

Experiment 18.—Tie the neck of a toy balloon partly filled with air and push it into a round-bottomed flask connected with the air-pump. The air inside the balloon presses on it and tends to push it outwards, but is

prevented by the elasticity of the balloon and the pressure of the air outside. Diminish this by exhausting the flask, and the balloon swells out.

Experiment 19.—A litre flask is fitted with one tube leading to the pump and another drawn out at the end inside the flask to a fine jet. Exhaust the air, stopping the second tube meanwhile; shut off the pump, and open the second tube under water. The pressure exerted on the surface of water in this tube being less than that outside, the water is forced upwards, and a fountain is obtained.

Great care must be taken to so arrange the tubes that no water can get to the pump.

PRACTICAL HELP IN THE ARITHMETIC LESSON.

BY GEORGE COLLAR, B.A., B.SC.,

Joint Author of "A New Arithmetic."

DECIMAL notation is generally well taught, although some teachers do not take sufficient care to present the matter from different points of view. The same, of course, is true in dealing with whole numbers: 36 is invariably called thirty-six; few teachers give a little variation by reminding the children that the digits denote 3 tens + 6 units. So ·36 is generally read "point, three, six," which is quite correct; but it should occasionally be called 3 tenths + 6 hundredths, and sometimes 36 hundredths. It must never be read as "point, thirty-six," because the expression "thirty-six" implies thirty-six units, and this is not what ·36 represents. As an exercise the children should be called upon to write decimal numbers from dictation, and then state their value. Thus: "Write down point, nought, four, three." The value of the expression ·043 should then be given, first as four hundredths + three thousandths; then as forty-three thousandths.

A great part of the usefulness of teaching decimals is lost unless it is made to lead up to approximate calculations. By drawing a line a yard long on the blackboard, and dividing it first into ten parts, then subdividing one of these into ten, and, if possible, continuing the subdivision, it is soon pressed home to the minds of the children that there is a very rapid falling off in value as we add figures to the right, and that very soon they may be neglected without making any appreciable difference in the result. Too much care cannot be exercised in impressing upon the children the fact that the decimal point is simply used to indicate the position of the digits. It has, so to speak, no *place* of its own, but the digits have *place* with respect to the point. And since the value of a digit depends upon its place, it is a much more accurate statement of the case to say that a decimal, or any other number, is multiplied by 10 by moving each digit one place to the left than to talk about "moving the point." The point must always come between the integers and the fractional part, and in this sense it can never be moved.

Another point that we might mention here is the statement that noughts may be written to the right of a decimal without causing any difference in the meaning. Children should be taught the use of decimals in approximate statements from the very first, and so they will understand that if we say that a stick is ·43 of a yard long, we mean that it measures 43 hundredths of a yard, and that although there may be a few thousandths, tens of thousandths, etc., we have not troubled about them. If, however, we say that the stick is ·430 yards in length, we mean that we have investigated the thousandths and find there are none. Let the children compare this with the statement that a man has £43 in the bank. He may have a few shillings and pence besides, but he considers £43 is sufficiently near the truth. But if he writes that he has £43, 0s. 0d. in the bank, he gives us a definite assurance that there are no shillings and no pence. Similar approximate statements with whole numbers should be introduced—for example, in the statements, "The earth is 91,000,000 miles from the sun," and "The earth is 24,000 miles in circumference." This gives an opportunity for explaining the difference between two phrases that are often confused—namely, "decimal places" and "significant figures." Significant figures or significant digits are the digits which are not ciphers. The above statements are correct to two significant digits, but it will be seen that they contain no decimal places at all. Again, if we write $\frac{20}{7} = 2{\cdot}857$, we give an answer which is correct to four significant figures but only to three decimal places.

The relation between decimal and vulgar fractions should be shown at this stage, and decimals should be converted into equivalent vulgar fractions in their lowest terms.

$$\cdot 56 = \tfrac{56}{100} = \tfrac{14}{25}.$$

Plenty of exercise should be given in this conversion, and the children should be led to see that in every case (as we are dealing with terminating decimals only at present) the denominator of the final fraction contains no other prime factors than twos and fives. Let the children search for the explanation of this—that since the decimal, when written in the form of a vulgar fraction, has always a power of 10 for its denominator, it can at that stage contain only the factors 2 and 5; and as in reducing to its lowest terms we merely remove factors which are found in both numerator and denominator, it is impossible for any new factors to make their appearance.

Having learned this property, children will soon see that if a vulgar fraction is given them whose denominator contains no other factors than 2 or 5, it may be converted into a decimal by multiplying the numerator and denominator by fives, if the factors are twos, and *vice versa*.

$$\tfrac{3}{4} = \tfrac{15}{20} = \tfrac{75}{100} = \cdot 75$$
$$\tfrac{11}{125} = \tfrac{22}{250} = \tfrac{44}{500} = \tfrac{88}{1000} = \cdot 088.$$

Children will soon recognise the powers of 2 and 5—namely, 2, 4, 8, 16, 32, 64; and 5, 25, 125, 625; and multiply a given power in one series by the corresponding power in the other in one step. This is one of those cases in which a particular rule for working should be taught before the general. The reason for this is that it arises from a fundamental property of decimals which we wish to teach. In practice it will be found that the number of fractions with denominators of this kind is very large, and they are frequently met with in this work. For want of preliminary practice in exercises of this kind, many students get into the habit of using long division to work such an example as $\frac{41}{125} = \cdot 328$, instead of multiplying by 8.

After abundant practice in examples that will reduce to finite decimals, children should be asked to apply the method to the reduction of $\frac{2}{3}$ or $\frac{5}{7}$. They will then discover for themselves the important fact that if a vulgar

fraction in its lowest terms contains any factors other than 2 and 5, it cannot be reduced to a finite decimal.

Their attention should be called next to the connection between the number of decimal places in the resulting decimal and the number of twos or fives in the given fraction, and they will be led to deduce and remember the fact that the number of decimal places in the result is equal to the number of twos or of fives (whichever is greater) in the denominator.

$\frac{7}{2^4} = \cdot4375$; four places.

$\frac{5^3 \times 2^3}{5} = 515{\cdot}375$; three places.

$\frac{4}{2^2 \times 5} = \cdot032$; three places.

The general rule for converting a vulgar fraction to a decimal can with advantage be left till the class has gone through division of decimals.

Addition and subtraction of decimals present no difficulty if only the place value of the digits be recognised and the children taught to put in the same column digits of the same order. Ciphers may be inserted in the earlier examples in order to make the same number of digits in each line.

THE METHODS OF SHERLOCK HOLMES IN NATURE STUDY.

BY E. A. GREENING LAMBORN.

SIR ARTHUR CONAN DOYLE'S famous detective was able, from an examination of an old bowler hat, to give an account of the appearance, occupation, habits, character, and worldly circumstances of its owner. Similarly, from an inspection of his friend's watch, he was enabled to discover that its former owner was a man of fallen estate and character, a drunkard, spendthrift, etc., a physical wreck, and a victim of chronic poverty. Many other instances will occur to the reader in which Holmes was able, by the exercise of his sense organs and his reasoning faculties on some concrete object, to construct a whole chain of facts with which that object was connected.

In the explanation of the methods by which he arrived at these results, it will be seen that the faculties upon which he depended for his conclusions were—

1. *Observation*, by which he obtained the external facts connected with the object. In the case of the hat above quoted, he observed the size, shape, condition, kind of lining, newly-cut grizzled hairs, smell of lime-cream, tallow stains, etc.

2. *Deduction*, by which he gained new facts as inferences from the ones already obtained. From the large size he deduced a large brain and consequent intellectual power, from the quality of the hat the well-to-do state of its purchaser, and from its interior stains his physical condition, among other inferences.

3. *Memory*, by which he was able to associate his newly-discovered facts with those in his past experience. For example, his memory informed him that the particular shape he had observed was in fashion three years before, so fixing the time of the hat's purchase.

4. *Constructive imagination*, by which he was able to combine his facts and build them into a homogeneous hypothesis—that the person he wished to discover was Henry Baker, a man formerly well-to-do, fallen on evil days, of sedentary habit, in poor domestic circumstances, etc. The story, of course, is that of "The Blue Carbuncle."

In his wonderful power of obtaining facts from the examination of concrete things the great detective of fiction is an ideal type of the nature-student. Though his observations of nature were limited mainly to man, and especially to criminal man, yet the faculties and the methods he employed are equally applicable to all natural objects; and if objection be made that Sherlock Holmes never existed, even without the knowledge that he is the creation of a man of science and had a prototype in fact in Dr. Bell of Edinburgh, it may be remembered that the great "nature-student" Cuvier, by the exercise of precisely the same faculties as those previously analysed, was able, from an examination of a single bone, to reconstruct in imagination the animal of which it formed a part. This illustration in actual fact is at least as wonderful as any of the detective's logical achievements in fiction. The faculties used by Sherlock Holmes and Cuvier are simply those possessed but not used by the average child in the elementary school. This is the great attraction of *Sherlock Holmes*. When he explains his course of reasoning to his astonished clients, they realise that all that he saw they might have seen also, and that the faculties which seemed supernatural were really the ordinary ones which they shared in common with him, but which in his case were used, in theirs were neglected. It should be noted, however, as Holmes repeatedly points out in his "explanations," that people fail, not to *see* things, but to *reason* from what they see. They do not "proceed to draw inferences from their observations." For instance, millions of people before Sir Isaac Newton had *seen* an apple fall from a tree, but no one until his day had ever gone further and reasoned *why* it fell. This has an important bearing on nature-study in schools, as it proves that, somewhat contrary to the common idea, it is in deductive power rather than in observation that training is required.

To illustrate the application of the foregoing to nature-study in the elementary school, the writer proposes to describe the progress of an "investigation" which took place in his own school. By the exercise of their faculties of observation, deduction, memory, and imagination on the *foot* of a creature they had never seen or heard of, the children were led to reconstruct a mental image of that creature, and to deduce various facts connected with its habits and surroundings. (The sceptical are invited to find the false link in the following chain of argument before talking of "impossibilities.")

A "newly-severed" foot was discovered by a boy on a local dust-heap, and not knowing to what manner of creature it belonged, he brought it to school to be examined. The foot was about as large as that of a small fowl, and was completely covered with thick white fur or feathers. This much was obvious from a superficial observation. Closer observation disclosed four toes beneath the covering, which was seen to consist of hair-like feathers. Memory thus assisted to furnish the first deduction, that it was the foot of a bird. (*N.B.*—This, as will be seen in the sequel, was *not* immediately obvious, as the foot superficially rather resembled that of a large white rabbit.) The deduction from the size of the foot was that the bird was rather larger than a partridge but smaller than a fowl. From the colour and thickness of the feathers on the foot the inference was that the bird would be warmly covered with thick, downy feathers in which white was the prevailing colour. But the children's previous experience had told them that, by a recognised law of nature, the structure of any creature depends upon its surroundings. The bird in question

must therefore have its home in a cold climate amid a snowy environment. It was therefore not an English bird, but probably came from the north. Geographical knowledge fixed its probable habitat as Northern Scotland, Norway, Sweden, or Russia. Further, the children knew, from a previous lesson on the stoat, that most wild creatures whose prevailing colour is white change their colour with the season and darken as the snow melts. The colour of the bird in question might be therefore expected to vary with the seasons.

Observation of the toes showed the claws to be small and weak. The owner was evidently not a bird of prey. It was not a swift runner either. Neither could it scratch the earth in search of food. Could it, like many weak-toed birds, be insectivorous? The previous deduction of a cold climate negatived this hypothesis. It was certainly, from its feet and plumage, not a water-bird. "Eliminating the impossible," as Holmes did, it did not prey on other birds, nor get its food from beneath the ground, nor from the air nor the water. Therefore it must live on plants which grew above the ground. But its weak, muffled foot showed that it could not perch in trees to feed on fruit or berries (the rigorous climate, again, was against the presence of trees). Such a bird looked like starving until it was suggested that it fed on leaves and shoots of plants. This again corroborated the early inference of a harsh climate, as these would be almost the only food available. (Some of the children had read about the reindeer and its food.)

Again, the clumsy foot was much against the possibility of the construction of any nest. A bird with such a foot would most likely lay its eggs on the bare ground. In accordance with a law previously quoted, the eggs would probably be of a brown tint, mottled to resemble the earth. The number of eggs would tend to be large, first because "ground-game" are especially assailable by enemies and seldom rear the full brood, and also because, however many eggs are laid on the ground, there is no danger, as in trees, of any falling out of the nest.

Summing up the facts thus deduced from the foot, the children were invited to imagine, as its owner, a bird as large as a small hen, covered with thick white feathers even to its toes, inhabiting the countries round the Arctic Sea, feeding on lichens, leaves, and young shoots of plants, and laying a large number of brownish eggs on the bare ground. Obviously the next thing was to discover whether such a bird existed in fact, and if so, what it was called.

Sherlock Holmes having evolved such a description of an unknown individual, would have discovered the person answering to it by making inquiries in the locality in which he thought he might be found. As it was plainly impossible in this case to inquire in Northern Europe, a natural history book was procured, and the plates in it were examined to see if any one of them tallied with the mental image gained by the children. Practically all the children recognised at once a plate which was stated to be a picture of the ptarmigan. The appended description was then read by one of the boys, and it was seen that practically all the deductions were correct, and that also the printed account only supplemented the deduced one in some minor particulars. This the reader may see for himself by reference to any book on birds.

It is not, of course, suggested that children could possibly arrive at such a result unguided, but it is in good faith asserted that all the deductions above stated were elicited from a class of older scholars who had never seen more of the bird in question than the foot they had before them. Such an object lesson as the one described is doubtless very uncommon, and opportunities for a similar prolonged course of reasoning would rarely occur in school work; but the writer's aim in describing it is to show the possibility of applying in school work those methods and faculties which Sherlock Holmes in fiction and Cuvier in fact used with such striking results. It seemed an exceptionally good illustration of the way in which the various faculties should co-operate and their results be co-ordinated in the "scientific" examination of a natural object. But in every nature lesson examples will occur of the way in which a single observation may furnish several deductions, which may again be associated with facts already in the memory to enable the imagination to build up a hypothesis.

INDIAN CLUB EXERCISES

FOR SENIOR PUPILS IN ELEMENTARY SCHOOLS.

BY H. RIPPON-SEYMOUR,

Chief Instructor, George Watson's College, Edinburgh; Member International Congress on Physical Education, Paris, 1900; Author of "Physical Training," etc.

INDIAN club exercises should not be taught to junior pupils under twelve or thirteen years, as they are in some cases of too complicated a nature for young children. After a thorough course of physical and dumb-bell exercises, extending over, say, five or six years of school life, Indian club exercises will be welcomed by the pupils as a pleasant change.

From a developmental or "nutritive" standpoint these exercises are not perhaps of great value, but they are extremely useful in cultivating ambidexterity and in producing well-balanced and graceful movements of the arms, and of the body from the hips upward.

FIG. 1.

A few remarks as to the shape and weight of the clubs may not be amiss, as too frequently as much harm as good is done by making children use unsuitable and over-weighty apparatus.

For children of twelve to thirteen the clubs should certainly not *exceed* three-quarters of a pound each in weight—a little less if possible; and for girls this weight should never be exceeded. For well-grown boys of fourteen, clubs of one pound are quite suitable.

The correct shape of the club greatly assists in its successful manipulation. After experimenting with a variety of shapes and sizes, I have found that the following dimensions are most suitable both as regards size and weight:—1 lb. clubs—length, 20½ inches; diameter of body, 3¼ inches; diameter of grip, ⅞ inch. ¾ lb. clubs—length, 17½ inches; diameter of body, 2¾ inches; diameter of grip, ¾ inch.

EXERCISES.

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In marching at the "slope" the elbows must be kept close to the sides, the hands steady.

Fig. 2.

Fig. 3.

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"Ready."—After the class is opened out, the command "Ready" is given, when the clubs must be raised from the shoulder by tightening the grasp of the fingers to a vertical position, the hands nearly as high as, and about ten inches in front of, the shoulders. At the same time the right foot should be carried eight or ten inches to the right, the weight of the body being carried equally on both feet (Fig. 3).

Single Outward Swing.

1. **"One."**—From the "Ready" position, and grasping the club not too firmly, push the right hand straight above the head, arm and club in a straight line from the shoulder, and *at once*, without pause, circle the arm and club away to the right, down past the front of the body and up to straight-arm over the head, completing the circle (Fig. 4). (Note the manner in which the club is grasped in this type of swing.)

This may be repeated several times until the whole class performs the movement correctly and in unison, the last movement being made by bringing the hand and club to the "Ready" position on the completion of the circle.

2. **"One."**—Perform the same kind of movement with the left hand and club. Swing straight to the left, down, and up to its position over the head. Repeat as often as required by giving the words "two," "three," "four," etc.

Single Inward Swing.

3. **"One."**—Raise the right hand and club as before, and circle the arm *inwards*, or to the left and down, the arm passing across the front of the face, at the commencement of the movement. Complete the circle with the arm straight, and repeat the movement on the command **"Two," "Three,"** etc.

4. **"One."**—Perform an *inward* circle with the left hand and club, the arm moving towards the body at the commencement of the movement. Repeat, and finish when desired by bringing the club to the "Ready" position.

Double Right Swing.

5. **"One."**—Raise both clubs to straight-arm above the head, and immediately send them away to the right, describing a complete straight-arm circle with

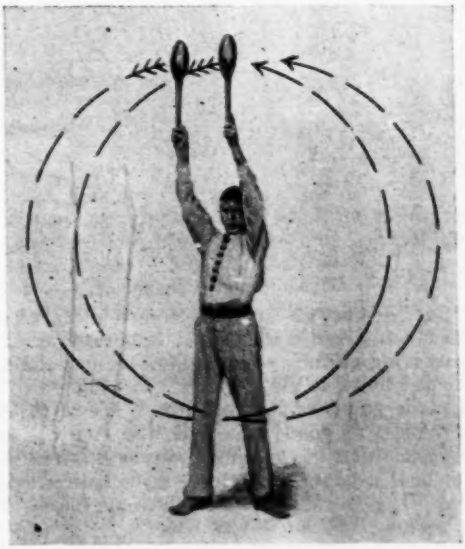

Fig. 5.

each. Repeat as often as desired, and finish by coming to the "Ready" position.

must therefore have its home in a cold climate amid a snowy environment. It was therefore not an English bird, but probably came from the north. Geographical knowledge fixed its probable habitat as Northern Scotland, Norway, Sweden, or Russia. Further, the children knew, from a previous lesson on the stoat, that most wild creatures whose prevailing colour is white change their colour with the season and darken as the snow melts. The colour of the bird in question might be therefore expected to vary with the seasons.

Observation of the toes showed the claws to be small and weak. The owner was evidently not a bird of prey. It was not a swift runner either. Neither could it scratch the earth in search of food. Could it, like many weak-toed birds, be insectivorous? The previous deduction of a cold climate negatived this hypothesis. It was certainly, from its feet and plumage, not a water-bird. "Eliminating the impossible," as Holmes did, it did not prey on other birds, nor get its food from beneath the ground, nor from the air nor the water. Therefore it must live on plants which grew above the ground. But its weak, muffled foot showed that it could not perch in trees to feed on fruit or berries (the rigorous climate, again, was against the presence of trees). Such a bird looked like starving until it was suggested that it fed on leaves and shoots of plants. This again corroborated the early inference of a harsh climate, as these would be almost the only food available. (Some of the children had read about the reindeer and its food.)

Again, the clumsy foot was much against the possibility of the construction of any nest. A bird with such a foot would most likely lay its eggs on the bare ground. In accordance with a law previously quoted, the eggs would probably be of a brown tint, mottled to resemble the earth. The number of eggs would tend to be large, first because "ground-game" are especially assailable by enemies and seldom rear the full brood, and also because, however many eggs are laid on the ground, there is no danger, as in trees, of any falling out of the nest.

Summing up the facts thus deduced from the foot, the children were invited to imagine, as its owner, a bird as large as a small hen, covered with thick white feathers even to its toes, inhabiting the countries round the Arctic Sea, feeding on lichens, leaves, and young shoots of plants, and laying a large number of brownish eggs on the bare ground. Obviously the next thing was to discover whether such a bird existed in fact, and if so, what it was called.

Sherlock Holmes having evolved such a description of an unknown individual, would have discovered the person answering to it by making inquiries in the locality in which he thought he might be found. As it was plainly impossible in this case to inquire in Northern Europe, a natural history book was procured, and the plates in it were examined to see if any one of them tallied with the mental image gained by the children. Practically all the children recognised at once a plate which was stated to be a picture of the ptarmigan. The appended description was then read by one of the boys, and it was seen that practically all the deductions were correct, and that also the printed account only supplemented the deduced one in some minor particulars. This the reader may see for himself by reference to any book on birds.

It is not, of course, suggested that children could possibly arrive at such a result unguided, but it is in good faith asserted that all the deductions above stated were elicited from a class of older scholars who had never seen more of the bird in question than the foot they had before them. Such an object lesson as the one described is doubtless very uncommon, and opportunities for a similar prolonged course of reasoning would rarely occur in school work; but the writer's aim in describing it is to show the possibility of applying in school work those methods and faculties which Sherlock Holmes in fiction and Cuvier in fact used with such striking results. It seemed an exceptionally good illustration of the way in which the various faculties should co-operate and their results be co-ordinated in the "scientific" examination of a natural object. But in every nature lesson examples will occur of the way in which a single observation may furnish several deductions, which may again be associated with facts already in the memory to enable the imagination to build up a hypothesis.

INDIAN CLUB EXERCISES

FOR SENIOR PUPILS IN ELEMENTARY SCHOOLS.

BY H. RIPPON-SEYMOUR,

Chief Instructor, George Watson's College, Edinburgh; Member International Congress on Physical Education, Paris, 1900; Author of "Physical Training," etc.

INDIAN club exercises should not be taught to junior pupils under twelve or thirteen years, as they are in some cases of too complicated a nature for young children. After a thorough course of physical and dumb-bell exercises, extending over, say, five or six years of school life, Indian club exercises will be welcomed by the pupils as a pleasant change.

From a developmental or "nutritive" standpoint these exercises are not perhaps of great value, but they are extremely useful in cultivating ambidexterity and in producing well-balanced and graceful movements of the arms, and of the body from the hips upward.

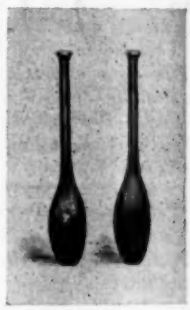

FIG. 1.

A few remarks as to the shape and weight of the clubs may not be amiss, as too frequently as much harm as good is done by making children use unsuitable and over-weighty apparatus.

For children of twelve to thirteen the clubs should certainly not *exceed* three-quarters of a pound each in weight—a little less if possible; and for girls this weight should never be exceeded. For well-grown boys of fourteen, clubs of one pound are quite suitable.

The correct shape of the club greatly assists in its successful manipulation. After experimenting with a variety of shapes and sizes, I have found that the following dimensions are most suitable both as regards size and weight:—1 lb. clubs—length, 20½ inches; diameter of body, 3¼ inches; diameter of grip, ⅞ inch. ¾ lb. clubs—length, 17½ inches; diameter of body, 2¾ inches; diameter of grip, ¾ inch.

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In marching at the "slope" the elbows must be kept close to the sides, the hands steady.

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"**Ready.**"—After the class is opened out, the command "Ready" is given, when the clubs must be raised from the shoulder by tightening the grasp of the fingers to a vertical position, the hands nearly as high as, and about ten inches in front of, the shoulders. At the same time the right foot should be carried eight or ten inches to the right, the weight of the body being carried equally on both feet (Fig. 3).

Single Outward Swing.

1. "**One.**"—From the "Ready" position, and grasping the club not too firmly, push the right hand straight above the head, arm and club in a straight line from the shoulder, and *at once*, without pause, circle the arm and club away to the right, down past the front of the body and up to straight-arm over the head, completing the circle (Fig. 4). (Note the manner in which the club is grasped in this type of swing.)

This may be repeated several times until the whole class performs the movement correctly and in unison, the last movement being made by bringing the hand and club to the "Ready" position on the completion of the circle.

2. "**One.**"—Perform the same kind of movement with the left hand and club. Swing straight to the left, down, and up to its position over the head. Repeat as often as required by giving the words "two," "three," "four," etc.

Single Inward Swing.

3. "**One.**"—Raise the right hand and club as before, and circle the arm *inwards*, or to the left and down, the arm passing across the front of the face, at the commencement of the movement. Complete the circle with the arm straight, and repeat the movement on the command "**Two,**" "**Three,**" etc.

4. "**One.**"—Perform an *inward* circle with the left hand and club, the arm moving towards the body at the commencement of the movement. Repeat, and finish when desired by bringing the club to the "Ready" position.

Fig. 4.

Double Right Swing.

5. "**One.**"—Raise both clubs to straight-arm above the head, and immediately send them away to the right, describing a complete straight-arm circle with each. Repeat as often as desired, and finish by coming to the "Ready" position.

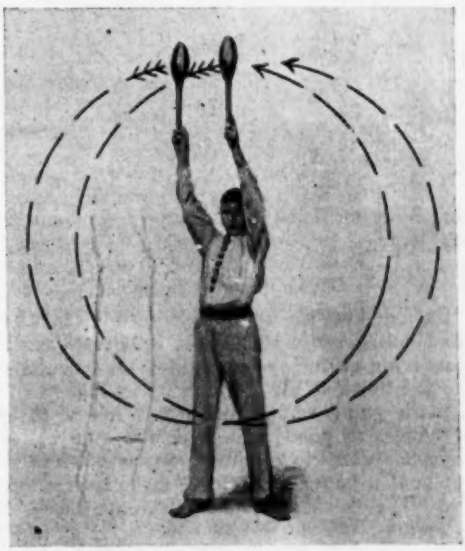


Fig. 5.

It will be at once seen that although both clubs move in one direction, the hands are really describing opposite circles, the right hand making an outward and the left hand an inward circle (Fig. 5).

Double Left Swing.

6. "**One.**"—Raise both clubs as before, and send them to the left, and complete the circle. Repeat, and finish at the "Ready" position.

In performing the double right and left swings, the upper part of the body *may* be allowed to turn slightly in the direction of the swing or *pull* of the clubs, but the feet should not move from their position, and on no account must the body *sway* from side to side.

Double Outward Swing.

7. "**One.**"—Raise the clubs over the head as before, and swing both outwards—away from each other—as described in Nos. 1 and 2. The arms should cross each other first in the lower and then in the upper part of the circle, without effort or visible strain on the part of the pupil. Either arm may be placed uppermost at the crossing, but the pupil should be instructed to

Fig. 6.

practice both methods (Fig. 6). Repeat, and finish at the "Ready" position.

Double Inward Swing.

8. "**One.**"—Raise the clubs as before, and at once cross the hands and describe an *inward* circle with each, the hands arriving at their original position over the head. Repeat and finish at the "Ready" position.

When the pupils can perform the whole of the foregoing swings, in good style and well together, they should be instructed to go through the series from Nos. 1 to 8 without a pause, performing eight swings in each exercise. The word of command would be,—"First Series, judging the time—**Commence.**"

Indian club exercises are much improved, when perfected, by the use of music, which is generally much appreciated by pupils. Music in $\frac{3}{4}$ or waltz time, played rather slowly, is the most suitable for the purpose.

The author will be pleased to answer in these columns questions of general interest on drill and physical training. Letters should be addressed to the **Author, care of the Editor,** *and must enclose the coupon on back page of cover.*

CORRELATION: THE METHOD OF THE FUTURE.

BY A BRADFORD CLASS TEACHER.

OWING to the gradual widening of our school curriculum, the teacher is often bewildered in making a choice of subjects, and still more so in keeping them well in hand.

So varied and divergent are the lines of thought along which they apparently work that the result is extra preparation, new demands on his resources.

Take, as an example, word-building—that heroic attempt at teaching spelling, always a bugbear to the average English scholar.

Rules and exceptions—the latter displaying lists as formidable as the former—are flung in rapid succession at the heads of our pupils, with effects often disastrous, and at times even the teacher receives a little shock on being obliged to revise his own orthography.

Why this failure? Because spelling is here taught as an isolated subject—that is, it remains uncorrelated with other subjects, such as composition.

The traditional view was, and in many cases is, that each subject is to be "pigeon-holed" in the school time-table; that it is to be sacredly withheld from its fellows; that it is to be taken down, dusted, and replaced at a certain stated hour.

To breathe any other subject at that time would be profanity. ("This is *not* a history lesson, John!") But knowledge, we must remember, is an *organic whole*. The different elements, which we call subjects, are so closely interrelated that the too strict adherence to arbitrary divisions has done much harm.

In other words, we must seek to correlate our subjects wherever it is possible to do so naturally, for "to unify is to simplify."

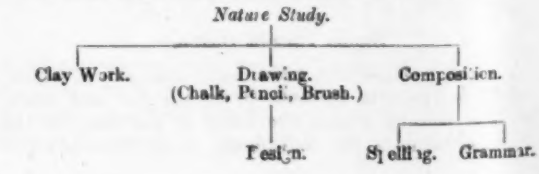
The object of the teacher is to instruct and to educate. In the former case, by means of certain subjects (impression subjects) he endeavours to create in the minds of his pupils certain vivid and well-defined ideas or conceptions; in the latter, to give the recipients power to express these in various modes—that is, by means of certain other subjects (expression subjects).

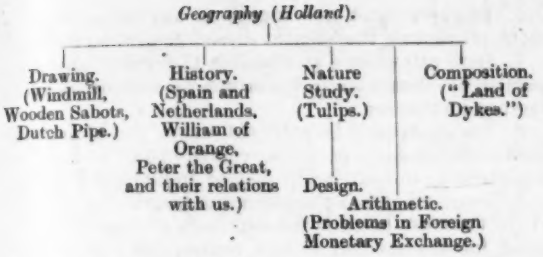
What are the essentials of an impression subject?

It must, by its charm and freshness, appeal, interest, and engage hand, eye, and mind—that is to say, it must create a vivid impression. Moreover, it should offer many points of contact with other elements of knowledge.

Nature study, geography, and history at once suggest themselves as impression subjects, though the first-named stands pre-eminent, since it satisfies all the needs above stated.

The following table shows the correlation method:—




Geography (Holland).
Drawing. (Windmill, Wooden Sabots, Dutch Pipe.)
History. (Spain and Netherlands, William of Orange, Peter the Great, and their relations with us.)
Nature Study. (Tulips.)
Composition. ("Land of Dykes.")
Design.
Arithmetic. (Problems in Foreign Monetary Exchange.)

It will be observed that in some cases the subjects do not stand to each other in the relation spoken of above; but still they are grouped in a manner which can in no sense be called arbitrary. They are organically related.

A scheme of this kind has, after a year's trial, proved most satisfactory in its results. The pupils have entered into its spirit, and unconsciously have been led to realise the truth of the unity of knowledge.

What are its advantages?

1. A theme being chosen, the teacher can concentrate most of his week's work on it.

2. The subjects attempted, being approached from all points, are thoroughly mastered.

3. The pupil, as well as the teacher, learns the laws of cause and effect, and traces connections not at first sight apparent. The week's interest is sustained.

4. The scheme can be repeated from year to year with but little modification, since the quality and quantity would be adapted to the capacity of each class.

Practical Hints.

(*Nature Study as Impression Subject.*)

1. *Nature Study.*—Taken in ordinary way. Notes and sketches made in notebooks by older scholars.

2. *Clay Work.*—Modelling from object or a simple part of it, often enlarged if object be small.

3. *Drawing from Nature.*—With pencil or brush, or both combined. Sheets of drawings may often find a place in composition books, illustrating text.

4. *Design.*—A few rough sketches, showing possible disposition of masses and connecting lines, are first drawn on blackboard.

Pupils are then allowed to draw on waste sheets two or three designs showing variations on above. The best effort of each pupil, when corrected, is to be copied in drawing book during next drawing lesson, and afterwards painted according to a colour scheme, if so desired.

In this one subject it will be seen that much time may be spent, especially in upper classes where special attention is given to art work. Discretion is, of course, required here, perhaps more than in any other direction.

5. *Composition.*—In the case of older scholars this amounts to little more than an expansion of notes taken during the impression subject lesson. For younger pupils the teacher may use his own methods, though in both cases the matter should be first gone through orally. For text illustrations see 3.

6. *Spelling.*—A list of words likely to occur in the composition is made. It is a useful plan to draw up a list of suffixes and other modifications such as are found in the word-building book (afterwards consigned to the flames), and by applying these to the first list manufacture a *real, living* word-building book, which can be used and amplified from year to year.

In this way can the teacher be sure of his ground. The words themselves are familiar to the scholar, and the rules in connection with them are learnt, a few at a time, and, most important of all, *when the need for them is felt.*

7. *Grammar.*—Again is composition made the basis, as sentences actually written by pupils can be used as models or warnings.

Since the subject-matter, expressed in the pupil's own words, will be now familiar and interesting, the children will look upon grammar in its true light, as an aid to composition.

In certain cases the impression subject may be made the theme of a poem or song. Reference to the works of Wordsworth, Longfellow, Tennyson, Schubert, and Abt will show that many of them are full of ideas on nature. In conclusion, the writer is fully aware of the serious limitations imposed upon many teachers, especially town dwellers, in carrying out a scheme of this character.

Yet to those who, after due consideration, resolve to give it a trial, if only in part, he can promise a feeling of inspiration, something of the fascination of a research student who is ever on the search, not so much for new *facts* in knowledge as for new *relationships* between the old ones.

COMMERCIAL EDUCATION.

THE syllabus for the commercial and craft examinations to be held in 1905 by the Examinations Board of the National Union of Teachers has just been published.

The most important feature in this edition is the scheme for the issue of commercial and craft diplomas, which has been designed in order to give students additional facilities for the registration of attainments. The aim is to combine a number of subjects so as to provide a complete educational course having direct reference to the future work of the student. Thus the craft syllabus will include plane and solid geometry, design, clay modelling, workshop arithmetic, wood-work and metal-work; while the commercial scheme covers the usual commercial subjects and modern languages.

The large increase in the number of entries last spring encouraged the Board to consider favourably requests for an extension of the syllabus which had been received from education authorities, teachers, and others in various parts of the country. As a result, six additional subjects have been included.

The courses in French, German, and Spanish have been recast, with a view to encouraging instruction by what is known as the "direct" method—the system which avoids the medium of translation, and follows the natural order in which children learn to speak the mother tongue. Oral examinations will be held in each of the three languages.

In future a certain amount of commercial correspondence will be included in the typewriting syllabus, the Board of Education having declined to recognise this subject unless combined with commercial correspondence.

Each subject has been divided into three stages, designed to cover a three years' course. One gratifying result of this system has been to encourage students to remain at school until they have obtained the certificate in the highest grade.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

THE EVENING SCHOOL REGULATIONS.

I PROPOSE to give my readers a kind of digest, with comments, of the current regulations for evening schools. All teachers in such schools will find these notes useful, and are advised to keep them affixed to a wall or cupboard, so as to be ready for reference. The evening school regulations are conjoined with those relating to technical institutions and schools of art and art classes. I have culled only those dealing with the evening continuation school.

Rules for E.C. School Teachers.

1. "The Board of Education considers it desirable that functions of real importance should be placed by the councils in the hands of the body that actually manages the school."

2. The scheme of organisation or course of study should be applicable to the local circumstances.

3. Sound organisation and continuous study are to be aimed at.

4. "The Board attach great importance to the necessity of correlating the component parts of a student's instruction, with a view of increasing their educational value as well as their practical utility," and "are prepared to approve class programmes of instruction which do not correspond with any of the usual 'subjects' of the school."

5. "No student may be admitted to any course who is not sufficiently prepared to benefit by the instruction given in that course."

Teachers should make a point of ascertaining the fitness of the students as soon as possible after the opening of the session, and transfer the insufficiently prepared.

6. "Preliminary courses should be arranged for, when needed, of subjects included in Division I., treated as affording the pupils a compact training connecting their previous work in the elementary school with their coming technical studies. For example, for youths who have entered the building or engineering trade the intelligent reading of passages relating to inventions, processes, or materials, and the examination and oral description of objects of industrial interest, form the basis of composition exercises." Mensuration exercises substituted for mere arithmetic.

7. "Arrangements should be made, as far as practicable, to provide for a progressive course of instruction for students attending in successive years."

8. Classes for adult teachers, though not for pupil teachers, will be recognised for grant under these regulations.

9. Fees must, as a rule, be charged.

10. Teachers must be paid a fixed salary.

Grant Conditions.

1. "There must be at least one of the managers able to visit the school frequently."

2. No student under twelve years of age may be registered.

3. The inspectors will ascertain, in such a manner as may be necessary, whether the conditions are fulfilled.

4. A week's notice of any alteration in the teaching staff or time-table must be given to the inspector.

5. Suitable fees must be charged, and there must be adequate local support.

6. Teachers must not engage in any other employment preventing the efficient discharge of their duties.

7. Mere attendance at a course of lectures unaccompanied by class exercises will not be considered satisfactory instruction.

8. The grant may be withheld on account of any students attending any particular course whom the inspector reports to be unqualified by lack of preliminary training.

9. Twenty hours is the minimum length of a course.

10. Fourteen hours is the minimum attendance recognised for any student in any course, and one hundred and sixty hours' instruction is the maximum allowable for grant purposes for any student.

11. No lesson of less than half an hour will be recognised in Division I., and not less than one hour in Divisions II. and III. In science, not less than forty minutes for theory, and not less than one and a half hours in practical work, must be arranged for in each lesson. In Division V. the lesson must be at least forty minutes long.

12. Managers are responsible for the accuracy of the registration. The Board may ask for any register to be forwarded. There must be an admission register and an attendance register.

13. "An attendance of not less than an hour may include five minutes for registration or other necessary preliminaries."

"The attendance of a student must be registered before the instruction begins." Each subject must be separately registered.

14. At least a week's notice of an intended visit to a gallery, museum, or other institution must be given to the inspector.

Hints to Rural Teachers.

For rural schools I advise, in the case of boys, that the session should open early in the autumn, on three nights in the week, in order to cover most of the ground before Christmas. The attendance, owing to bad weather, etc., invariably falls off in January. The school should meet for two hours. I suggest two or three subjects only. In most cases two will suffice; and in such cases I should join one demanding much mental application, such as arithmetic, with one of a less exacting nature, such as drawing, taking arithmetic the first hour and drawing the second hour. For rural schools meeting three evenings, and in which three subjects are suggested, try wood-carving, arithmetic, and reading.

Elementary rural science and drawing or woodwork would form a useful and new course for a rural school. Lectures on the theory of horticulture in the winter, to be followed by practical work in the spring and summer, might be suitable in some cases.

Experience goes to show that it is unreasonable to expect two hours of sustained mental work from lads or girls who have been at work all day and who often have walked long distances to school. Hence arrange such subject as handicraft, drawing, or needlework for the second half of the evening.

Send a report at the end of the first half of the session to the parents of each student. Send a post card or note to inquire as to the absence of every scholar. Keep an account of the progress of each, to help you in succeeding sessions. If you have only a few students, go in for individual rather than class teaching. Expect the students to accomplish some definite work. Many, I fear, attend and merely pass the time away. Hold an occasional examination in subjects which lend themselves to it. Encourage the students to do home work.

The Practical Infant-School Teacher.

A VILLAGE SCHOOL IN THE TYROLESE ALPS.

BY CATHERINE I. DODD.

THREE thousand feet above the sea lies the little Alpine village Lermoos in Tyrol, shut in by the mighty Zugspitze with its snowy summit rising from rocky mountains of the Wetterstein range and the silvery peaks of the Sonnenspitze. It is a village with only seven hundred inhabitants and one shop up a crazy stairway—a shop where neither lemons, nor matches, methylated spirits, nor string, nor steel pens are to be bought, and the shopper must tramp to another village some three miles distant to provide himself with such necessaries.

It is a joyous little village, blazing with colour and bathed in sunshine, except on its gray, sodden days, when the rain comes steadily down and mists hang round the mountains. The church, with its round Tyrolese dome and steeple, stands in an elevated spot; and the sunburnt wooden houses, with overhanging balconies, great barns, and piles of stacked wood, are set down higgledy-piggledy at the caprice of the owner. There are no streets, but little mountain paths leading to the houses on the hillsides and the pasture lands above. Colour delights the eye at every turn. Some of the roofs are green, and some of the gables blue. Gay little gardens brimming over with flowers run out into the highway or straggle up the hillside. The natural blossoms of earth are not enough for the Tyrolese peasant, so he fastens gorgeous metal balls—gold and silver, blue and crimson—to long sticks, and plants them among his sunflowers, stocks, and dahlias. Not colour alone, but aggressive contrasts of colour, are his joy.

To reach Lermoos one must tramp weary miles, with one's pack on one's back, through pine-wood valleys or over bewildering passes of entrancing beauty. The roads are convenient for good bicycle riders, who can go uphill for hours without murmuring, and for the high-minded and purse-proud there are coaches. The maps in the indispensable Baedeker mark the route. One may take the coach from Imst to Nassereit, and from thence, over the Fern Pass, descend among the mountains and lakes, through Biberweir, into Lermoos (this is a long and expensive journey); or one may drive from Garmisch-Partenkirchen through the pines of the Loisachthal, passing the frontier inn at Griesen, for Lermoos is just beyond the border which separates the rocky Tyrol from the Bavarian Highlands.

A deep stillness settles upon the sojourner at Lermoos, broken only by occasional coaches rumbling by and the sweet jangle of bells, as the slow dun cows step soberly down from the pastures at milking-time. At evening the huntsmen and climbers come home from the mountains, reminding one of Robin Hood and the banished duke in the Forest of Arden in their woodland green, with Alpine cap and feathers, bare knees, and tight breeches laced up the thighs with green cords. Their talk is of game and the fish in the mountain lakes; and we sup daintily on trout and venison, served by a sweet-voiced waitress, on whose tongue the German language trips melodiously as liquid Italian.

To tell of the walks in the Alpine meadows, the flowers that grow there, the mists that creep around the mountains, and the sunset glow that touches the mighty masses in the evening, warming them into a glorious red, would be pleasant; but I am bidden to write about the little school in this Alpine village, so I must get to my subject.

The schoolhouse is a square white building with green doors and green shutters. One half is for *Knaben* (boys) and the other for *Mädchen* (girls).

I was bidden to go to the *Mädchen* end of the building and ask for one of the sisters. Around the school was a garden full of flowers, some currant bushes, and a few herbs and cabbages to supply the modest wants of the two sisters. A gentle-faced sister, in a soft blue gown and apron and freshly-starched white head-dress and collar, admitted us, and showed us into the schoolrooms.

Children are compelled to attend school from six to fourteen years of age. There was no provision for children under six.

Classes I. and II., consisting of the children of six and seven years, boys and girls, made up the junior school. The number of these two classes did not exceed thirty. They were taught together in one room. Religion, reading, writing, arithmetic, singing, drawing, nature study, and handwork were the subjects on the time-table.

After Class II. the boys and the girls were separated into upper boys' school and upper girls' school. One master took charge of the boys, and one sister of the girls, and taught all the subjects, which included, besides the subjects taught in the lower school, geography, history, some literature, and a little science.

As the upper schools consisted of Classes III., IV., V., VI., VII., and VIII., all children from eight to fourteen, these teachers had difficult and varied work. The number in each case, however, rarely reached forty.

At the age of fourteen the children left school, but were compelled to attend Sunday school for two years longer to continue their studies.

"What studies?" I asked.

"Scripture, the Catechism, the lives of the saints, reading, writing, and arithmetic," replied the sister.

"Do you teach secular subjects on Sunday?" I asked.

"Oh yes! why not?" replied the sensible sister. "The children forget what they have learned in school unless we recapitulate to impress it upon their memory."

I examined the chart, which summarised the chief points in the school organisation. There were three divisions, each with its own regulations—winter school, summer school, Sunday school.

"You see," explained the sister, "these children have to help their parents with the wood, the hay, the potatoes, and the cows, and we must arrange the school work so as to give them time to help their parents."

And very admirably this sensible plan was carried out. The winter school began October 15th, and lasted until April 15th, and the children attended school from 8.30 in the morning until 10.30. They returned in the afternoon at 1.30, and remained until 4 p.m.

The summer school began May 1st, and lasted until July 1st; and the children attended school from 7.30 until 10, and returned in the afternoon from 1 until 3.30.

During July, August, September—the three months of strenuous labour for these Alpine peasants, when children are useful in the field, forest, and pasture land—the school is closed. My visit was made in September, and as the school did not open until October 15th, I did not see the children in school, though in the village and on the mountain one met the shy, dark-eyed, bare-legged little ones daily, and responded to their greetings in passing them.

The Sunday school was carried on only during the winter term, from October 15th to April 15th, and all children of school age were compelled to attend every Sunday from 1.30 to 3.30. The children above school age were also compelled to attend every Sunday until after their sixteenth birthday.

The schoolrooms were large, light, and well furnished with modern furniture and apparatus. The large windows had deep window seats filled with tall geraniums in pots, which screened the room from the road. Pictures of the emperor, some saints, and Jesus Christ adorned each classroom, and a crucifix had a prominent place.

Nature study was a keen pleasure to some of the children, as a little collection made by a girl of Class VI. testified. There were some handsome hawk-moths, the familiar tiger and peacock butterflies, and the red admiral; also a handsome creature very common in these parts called the "mourning mantle," a large butterfly with wings that look black, but really are russet brown inlaid with sapphire spots and edged with deep yellow. It is a joy to see this glorious insect alive, alighting on the bark of a poplar tree. There were a tiny lizard and a little blue frog among the girl's collection.

The sisters lived at the school, and did good works during the three months when their pupils were in the fields and on the Alp. We learned very little about the master who taught the boys. "He does not abide here," we were quaintly told; and again, "He is a stranger, and dwells not in the schoolhouse."

Education in the Transvaal and Orange River Colony.—We regret that space does not allow us to deal at length with the very interesting Report of the Director of Education which has reached us. It covers four years' work, beginning with the condition of things in 1900 while the war was actually in progress. It describes the development of camp schools, in which at one time there were as many as 29,000 children, and shows the steps that have been taken to meet the educational needs of the colonies in the future.

SCHOOL GARDENING FOR LITTLE CHILDREN.

BY LUCY R. LATTER.

PART IV.

"'Come wander with me,' she said,
'Into regions yet untrod,
And read what is still unread
In the manuscripts of God.'"

So far, the actual work of gardening in and out of doors has been mainly under consideration; it will now be interesting to see in what way it is related to the rest of the school curriculum. This will best be shown by a few general remarks followed by a reproduction of some of the plans of work for four or more weeks prepared for my own school.

In my second article I very briefly described the *care* by the children of the natural objects indoors. Such work can, of course, only be undertaken with small

"From the rough sod comes the soft-breathing flower."

groups of children. Provision is, however, made that every child shall take part in turn. The remaining children are occupied the while with nature work of another kind; those of the first class are encouraged to observe and record simple facts about the weather, and changes in the natural objects in their room. This comes under the heading "Calendar Work." In the lower classes the children make more or less temporary pictorial representations on their little blackboards of the plants, etc., in their respective rooms.

Measuring, weighing, money values (the children go out with a teacher to buy food for the doves, boxes for window gardening, new seeds, bast, tacks, etc.), are all taken in connection with the nature work and reading and writing wherever possible. Children under five years of age do nothing whatever in the way of reading and writing. They are wholly occupied with nature work, kindergarten occupations, games, stories, and free play. No reading, number, or writing lessons are ever taken in the afternoon; so that, with the exception

of the very minimum amount of time for needlework and knitting with the girls who have reached six years of age, kindergarten occupations, games, stories, and recitations take up the whole afternoon of even all the children over five years of age, and all this work is directly related to the nature study for the four or more weeks.

Real objects are always used as models in the drawing, modelling, and brushwork lessons, and the children are, of course, encouraged to make their own representations of the same.

It may here be noted that a special point is always made of drawing into the service of the school, for the children as well as for the teachers, the very best literature and art, to supplement the work with the natural objects themselves.

THE PLANNING OF THE WORK.

The *real* thing is always the starting-point, and this, as I have shown in my second article, is under observation long beforehand, sometimes for as long a period as a whole year.

After some experience with the real thing comes the search for an explanation and a further knowledge of the facts actually observed from the best and therefore highest authorities on the subject under consideration.

The point of view from which the subject shall be presented to the children is next determined, then what facts are most suitable for the children and the best means for helping them to find out these facts for themselves.

Lastly, suggestions are offered as to the way in which the children may desire and be helped to reproduce their experiences in concrete form, be it with a few paints and a brush, chalks or coloured pencils and paper, modelling paste, building bricks, or even pen and ink; also as to how the ideal side of the subject may be presented in picture, story, game, and verse. The method of procedure thus pursued in preparing for the specific work of each month or longer may be summarised as follows:—

A.—Experience with the real thing.
B. I.—Information or notes for the teacher.
B. II.—The standpoint from which the subject is to be considered with the children.
B. III.—The plan of work with the children. This includes work in the garden, walks to Greenwich Park or Blackheath, etc.
B. IV.—The gifts, occupations, games, stories, pictures and recitations used in connection.
B. V.—A list of books found useful in connection with B. I. and B. IV.

In reproducing some of the plans of work prepared for my own school, I do not, for I hope obvious reasons, purpose giving the notes or information for the teacher's use. I shall in each case, however, give a list of some of the books which I have found helpful *after* experience with the real thing or phenomenon.

In one year "Wind" was the subject round which our thoughts and work centred during the month of March, when the children had plenty of opportunity of seeing some of its effects in the school garden as well as elsewhere. The method of procedure was as follows:—

B. II.—The Standpoint from which the Subject is considered with the Children.

"The wind bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh, and whither it goeth."

"The breeze warbles, and the mute still air
Is music slumbering on her instrument."

The phenomena of wind inspire wonder, and stimulate the keenest search for the cause. The children feel the breath of the wind and hear its voices. They see it moving the plants in their garden and the trees in the road, or they see it blowing the clothes hung out by their mother or some one else to dry. At first the children think that the wind is caused by the moving objects, but by-and-by they begin to realise that the wind is not the effect but the cause of the varied movements perceived, and gradually the children rise to a simple conception of a single invisible power behind all things. Then they begin to wonder about the nature of this unseen force. We desire to help the children in this process of spiritual evolution without detracting from the wonder of the phenomena by any questions or explanations which may destroy vigour of mind. The wind cannot be seen; its existence can only be shown by its doings. We therefore lead the children to notice familiar manifestations of the wind's power, and provide opportunities for the observation of other effects of wind in different ways, dwelling largely upon its health-giving power, and as it affects our daily lives. Thus we seek to impress the children with the actual activities of wind, and leave them to make out its spiritual analogies for themselves.

B. III.—Plan of Work with the Children.

Introduce the subject with a chat about the weather. What did the children notice about it on their way to school? (If necessary, recall a recent rough day.) A wind was blowing. Bits of paper, etc., were driven along the roads by it. At times it was difficult to walk against it. All the plants in our garden were bent in one direction. Bits of paper were scattered over the beds and paths. Walls and hedges, etc., are able to stop the wind in its course, unless it be very rough. Sometimes the wind blows the children's hats off. It blows the clothes about which mother hangs out to dry. It helps to dry the clothes. It helps to dry the ground after rain.

Individual children go out and pick up the bits of paper, etc., blown over the beds and paths of the garden. They also help to tie up any plants blown down or bent by the wind there. A line is stretched somewhere in the playground—from the "veranda" railings—dolls' clothes, dusters, etc., washed by groups of children indoors are hung thereon, and the effects of the wind upon them observed.

The wind flies kites, drives sailing-boats, turns windmills, etc. It drives the clouds across the sky, and rocks the little birds in their nests on the trees (nests in some trees near the school recalled).

Kites previously made by the children let fly in the playground.

A little boat with a sail put out on a tub of water in the playground and watched.

Paper windmills made by the children used in the playground.

The children go into the playground and watch the clouds in the sky during windy weather.

The Wind as a Sower of Seed.

When we want to have some pretty flowers growing in school, what have we to do? Yes, we have to sow some seeds. And when we want to grow some radishes, some lettuces, and cabbages, etc., in our garden, what have

we to do? Last year we planted a great many seeds in our garden. The other day, when we went to look at some of the beds, we found some little plants coming up in beds where we had never put any seeds of the kind. Do you remember the names of these little plants? Cornflowers, eschscholtzia, sweet alyssum, and lettuce.

How did these little plants get into other beds? Some one who works and plays, although we cannot see him, must have sown those seeds. The wind sowed them. It blew them from the parent plants, carried them along, dropped them in the new beds, blew dust and leaves over them till they were covered. Then they took root, and now they have begun to come up. Who knows some little seeds which the wind sows in the fields and among the grass in the park and on the heath?

Individual children go to the garden to see if they can find any more plants which may have been brought there by the wind.

In the autumn the wind plays with the leaves and sends them whirling to the ground, where they help to keep the little seeds and roots buried there nice and warm. It blows the acorns and chestnuts from the tall trees in the woods and parks. * Recall the visit to Greenwich Park the previous autumn, and how we found the ground strewn with beautifully-coloured leaves and pretty acorns and chestnuts hidden among many of them. Where are some of those acorns and chestnuts now? (Growing in our school, in water and in earth.) Sometimes in autumn, too, the wind has a game with the trees in our fruit garden, and then the apples and pears come tumbling down to the ground without any help from us.

The different Winds and what they bring.

Compare the boisterous March winds with the gentle summer breezes—the zephyrs or "life-bringers." Sometimes the wind blows at one side of our house, sometimes at another—that is, it comes from different directions. * The north wind comes from cold countries, and often brings ice and snow. The south wind comes from the countries where the oranges and lemons grow, and brings warmth. The west wind comes from the ocean, and brings moisture—fog or rain; whilst the east wind travels overland, and brings dry and cold weather.

The first class children refer to their calendars for facts about the winds and what they brought at different times.

The Weather-vane.

The weather-vane on the top of the school tower. * Other vanes or weathercocks recalled. Where are they all usually placed? Reason why they are placed high up. * Description of the weather-vane. Its uses.

The children go into the playground to look at the weather-vane on the top of the school tower. A small model made of it indoors by individual children.

"Whichever way the wind doth blow,
Some heart is glad to have it so;
Then blow it east or blow it west,
The wind that blows, *that* wind is best."

The Wind as the World's great Physician.

Sometimes when we have been in school a long time we feel rather uncomfortable; then teacher opens the windows and door, and what happens? Mother too opens the bedroom window every morning after the children are all up and dressed. Why? And sometimes when we do not feel very well we go out in the air for a few minutes, and then we feel better. So, too, with our indoor plants, our doves, our snails, fish, etc. They all like to be fanned by the wind from time to time; it makes them feel fresher and happier. Even the beds in our garden are all the better when the wind can fan upon the soil.

Individual children dig up the empty beds in the garden, that the air may sweeten the soil. Individual children appointed to see that the doors of their class-rooms are left open during any break in the work, as well as after morning and afternoon school.

The Wind as an Embellisher, a Musician, etc.

The wind sometimes helps to clear up our garden and playground by blowing all the untidy bits of paper, dust, etc., into heaps which can be easily gathered up and taken away. It also makes the trees and plants look tidy by sending down all the leaves which have done their work on them to the earth, to make, perhaps, a cosy blanket for the little seeds lying there. Very often when we have been out in the wind for a little while our cheeks get fresh and rosy, and so too the south wind helps to make the fruit on the trees in our gardens pretty in summer and autumn. The wind makes the little flowers nod their heads, the leaves of the trees dance, and the grass wave to and fro. (Nature never shows so lovely when still as when in movement, and it is by the *wind* that all her charms of motion are produced.) The wind makes wonderful music in the woods. Sometimes it whispers, sometimes it sighs, moans, whistles, etc. * Recall the sough of the rain-laden sou'-easter that mourns its requiem over the fast-falling leaves in late November.

Visit to Greenwich Park. The effect of the wind on the grass, the flowers, and trees observed; also the sound of the wind through the trees—"Eolian whispers rippling and ruffling the newly-opened leaves."

The Wind Air in Motion.

Sometimes we neither hear nor feel any wind, the air is so still, and we say there is not a breath of air going. Big people often use a fan then. When they move it backwards and forwards near their face, they feel some cool air or a gentle wind being driven towards them; * so whenever we feel a wind blowing, it is only air being driven towards us, for wind is air busy at work.

Paper fans previously made by the children used and the effects described.

The children move the hand backwards and forwards from right to left, and then describe the effect. The same experiment with a wet hand.

Note.—In keeping the records of the weather, etc., the attention of the children is to be specially directed to the phenomena of wind this month.

Work in the Garden.

Picking up the pieces of paper, etc., blown on the beds and paths by the wind.

Tidying of borders.

Tying up and, if necessary, giving a support to any plants bent or blown down by the wind.

Digging up the empty beds, that the air may sweeten the soil.

Clearing the soil of any grubs, etc., which would likely be productive of injury to the plant later on.

Sowing of vegetable and flower seeds.

* Points with an asterisk against them are only for the upper part of the school.

IV. The Gifts, Occupations, Games, Stories, Pictures, and Recitations used in connection.

	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.
Drawing (Free and other).	Ship with sails; weather-vane; windmill; clothes drying on a line; seeds of sycamore, maple, fir, pine, etc. (from school store); windflower or anemone, dandelion; vase; tree near the school (poplar).	Ship with sails; weather-vane; windmill; seeds of sycamore, maple, fir, pine, etc.; windflower or anemone, dandelion; vase; tree near the school (poplar).	Ship with sail, fan, roof of a house from which smoke seems to be issuing, sycamore and maple seeds, wind-flower or anemone, small branch of a poplar tree.	Boat, nest in a branch of a tree, fan, poplar leaves, sycamore and maple seeds.	Kite, window, tub, clothes line and pegs.	Air balloons, clothes-pegs, kite, flag.
Brushwork and Colouring.	Boat sailing on the sea; seeds of sycamore, maple, fir, pine, etc.; anemones, dandelions.	Boat sailing on the sea; seeds of sycamore, maple, fir, pine, etc.; anemones, dandelions.	Clothes drying on a line, boy running after his hat, fan, flag, anemone, vase.	Kite, boat, flag, poplar leaves.		
Modelling.	Ship ("sails" prepared by babies added), windmill, weather-vane, vase, wind-flowers.	Ship ("sails" prepared by babies added), windmill, tub, vase, wind-flowers (*side view*).				
Paper Folding.	Ship with sails, double flower-vase, small balloon, threefold screen.	Kite, windmill, flower-vase, sailing-boat.	Window, ship with sail, flag, fourfold screen, fan.			
Cane and Paper Work.	Kites to fly in the playground.	Kites to fly in the playground.				Tails for kites.
Paper Cutting and Folding.	Wind toys for use in the playground.	Wind toys for use in the playground.				
Gift IV.		School or church with paper weather-vane added, window, garden, street, boat, chimney, windmill (*on the flat*).	School or church with paper weather-vane added, window, garden, street, boat, chimney, fence, wall, windmill (*on the flat*).			
Gift III.				School or church with paper weather-vane added, roof, window, garden, street, windmill (*on the flat*), chimneys.	School or church with paper weather-vane added, roof, window, garden, street, wall, chimneys, pond.	
Tablets (Squares).				Objects made with Gift III. reproduced on the flat.		
Rings and Sticks.			Kite, boat with sail, tub, windmill, fan, vase, wind-flower, tree.			
Sticks or Laths.				Boat, tub, window, fan, roof of a house with chimneys, windmill, tree.	Boat, tub, window, fan, tree, flag.	Boat, tub, window, fan, tree, flag.
Jointed Laths.					Tub, window, boat, fan, kite, flag.	
Thread Laying.					Kite, boat, flag, tub, dolly's stocking, balloon, pond.	Kite, boat, flag, tub, dolly's stocking, balloon, pond.
Sandwork.					Garden with flowers bent by the wind, park.	Garden with flowers bent by the wind, park.
Fraying.						Wind "dolls" for the garden to keep the birds from the young plants, white "sails" for ships modelled in Classes I. and II.
Bead Threading.						Chains for boats.
Games.	"The Wind-flower." "Wind Song." Another "Wind Song."	The Four Winds. The Wind.	The North Wind. The Song of the Wind.	The Windmill. Come, Little Leaves.	See the Windmill. The North Wind doth blow.	The Trees. Rock-a-bye, Baby (nurse's song). Washing Day. The Weather-vane.
Stories.	Odysseus and the Bag of Winds. Æneas and the Winds.	The Wind's Work. Spring and her Helpers.	How the West Wind helped Dandelion. The North Wind and the Sun.	The North Wind at Play. The Maple Leaf and the Violet.	The anxious Leaf. Apple, wake up.	A Wind Story. A Storm in a Tub.
Pictures.	Spring (Corot). The Mill (Ruysdael).	As in I.	As in I.	A Storm in a Tub (Frère). The Weather-vane (Froebel).	As in IV.	As in IV.
Recitations.	The Wind's Song.	When March Winds blow.	Who has seen the Wind?	Whichever way the Wind doth blow.		
Hymn.	A little ship was on the sea.	As in I.	As in I.	As in I.	As in I.	As in I.

B. V.—List of Books referred to for Information and Reading.

Natural Philosophy (Ganot's *Cours élémentaire de Physique*), E. Atkinson, Ph.D., F.C.S.; *Encyclopædia Britannica; Information for the People* (Vol. I.), Chambers; *Why the Wind Blows* (Science for All, Vol. I.); *How the Wind Changes* (Science for All, Vol. II.); *Physical Geography*, A. Geikie, F.R.S.; *Earth, Air, and Sky*, R. Bunting; *Life: its Nature, Varieties, and Phenomena*, Leo. H. Grindon; *The Queen of the Air*, Ruskin; *Letters to a Mother*, S. E. Blow; *Commentary on the Weather Vane*, Froebel (S. E. Blow's translation); *Two Children of the Foothills*, Elizabeth Harrison; *The Wind in the Tree* (the Tree Book), M. R. Jarvis; *The Odyssey* (Books V. and X.), Pope's or Butcher and Lang's translation; *The Æneid* (Book I.), Dryden's translation; *The Four Winds* ("Hiawatha"), Longfellow; *The White Man's Foot* ("Hiawatha"), Longfellow; *The Winds*, Bryant; *The Evening Wind*, Bryant; *Sweet and Low* ("The Princess"), Tennyson.

List of Books from which the Games, Stories, and Recitations have been selected.

Holiday Songs and Everyday Songs and Games, Emilie Poulsson; *Kindergarten Chimes*, K. D. Wiggin; *Songs for Little Children* (Vols. I. and II.), E. Smith; *Songs, Games, and Rhymes for the Nursery, Kindergarten, and Primary School*, E. L. Hailmann; *Song Stories for the Kindergarten*, Mildred J. Hill; *Little Games for Little People*, Dora Pearce; *Little Songs for Little Voices* (Book I.), Alfred Scott Gatty; *The Child's Song and Glee Book* (Part II.), H. Keatley Moore, Mus. Bac., B.A.; *Songs and Music of Froebel's Mother Play*, S. E. Blow's edition; *In the Child's World*, Emilie Poulsson; *Mother Stories*, Maud Lindsay; *The Story Hour*, K. D. Wiggin and N. A. Smith; *Child Garden*, March 1901; *Kindergarten Stories and Morning Talks*, S. E. Wiltse; *The Child World*, Gabriel Setoun; *A Child's Garden of Verses*, R. L. Stevenson; *Sing Song*, Christina Rossetti; *Primary Education*, March 1902; *A Book of Verses for Children*, E. V. Lucas.

(To be continued.)

NATURE KNOWLEDGE IN INFANT SCHOOLS.

SOME PRACTICAL SUGGESTIONS.

BY SOPHIE B. FLEAR.

So much has been said and written of late about the value and importance of nature teaching, that it is hardly needful to enlarge upon it to the readers of the *Practical Teacher*. Most of us, at all events, fully realise what wonderful lessons of life Nature teaches us when we watch her processes. How it quickens our powers of observation and trains our reason when we try to discover "how" and "why" Nature does this or that! How impossible all pettiness and self-assertion become when we are face to face with the mystery of life, giving place to a humility born of awe and reverence! Then, too, what an added source of pure enjoyment nature study affords! and life is not so full of joy that we can despise any avenue that will lead us and our children towards it.

All this, however, we know. What we do not know quite so well, perhaps, are the best methods to adopt in order to foster and encourage this observation of nature in our children, so that it may produce the good which we believe it theoretically to be capable of doing.

The following are a few practical suggestions as to some ways of furthering this end, though every teacher will think of others for herself.

The giving of nature lessons proper demands a paper to itself, and will be kept for a future occasion.

Though our time-tables are already overcrowded, I think it would be possible to devote a quarter of an hour at least twice a week, if not daily, to an attempt to record the results of some of the observations made by the children out of school. Too great importance can hardly be attached to this *record-keeping*.

Knowledge unexpressed is apt to be vague, confused, and indefinite; while expression tends to clear the mind and to make observation more exact, stimulates to fresh acquisition, and affords opportunities of removing errors.

Lastly, the records themselves may form the basis of generalisation and classification, without which our minds contain but a confused jumble of isolated and therefore valueless facts, which can in no sense be reckoned "knowledge."

Weather.—To begin with the simplest kind of nature record—namely, that of the weather. A large wall chart should be prepared for each month, with spaces for every day, in which the weather may be marked with coloured chalks—black for rain, gray for dull, cloudy weather, yellow for sunshine, and so on. This card should be decorated by one of the older children with a brushwork design; for here, as always, children care most for what they take part in themselves, and it is more essential that they shall be interested than that the card be beautiful.

At the end of the month a generalisation should be made as to the kind of weather prevalent throughout, and a comparison made with that of the same month in the previous year. Also, if the children are not too young, they may be led to see how the plant world has been affected by the weather.

Temperature.—In all classrooms a thermometer register is kept, but that is usually the work of a student teacher. Why should not this be done by the children? By this means they might learn practically the power of heat to expand and of cold to contract, while gaining, at the same time, a sense of the hygienic importance of the temperature of a room, which should be valuable to them afterwards.

Sky.—What is there in the whole universe more beautiful than the sky? Yet how few of our children have been trained to take pleasure in observing it! The poorest slum child, who has hardly any flowers or animals to observe, and much that is gross and ugly in its environment, has still the sky, with its marvellous colour and form, never the same for many minutes at a time, yet never anything but beautiful, day or night. What a glorious field for imagination! What a means of refinement and joy is lost by not directing children's attention to the careful observation of the sky! Here also to "record" is to "observe." One of the best ways of recording *cloud effects* in the daytime is by means of white chalk on rough blue sugar-paper. A few minutes' work will give quite beautiful and realistic results, and will delight the children. When twenty or thirty of these papers have been done, the children should have them all to look at, and make a classification of the different kinds of clouds from them. *Sun-*

DATE	DRAWING	WHERE FOUND	REMARKS
SEP 9		In a shady garden	This balsam fruit burst when touched. made a loud noise and shot out its seeds
SEP 10		In the hedges	Blackberries are quite ripe enough now for blackberrying
SEP 12		Flying over the river	Its wings were very gauzy. and looked beautifully coloured in the sunshine.

Fig. 1.

set effects can best be gained with paints in a winter afternoon brushwork lesson, and can hardly be produced during the suggested quarter of an hour.

In the winter the elder children might be encouraged to reproduce their observation of the *stars at night* by cutting holes in a piece of cardboard to represent the different constellations, and pasting yellow tissue paper behind. When held up to the light they look very star-like from a child's point of view.

Nature Charts.—For a record of miscellaneous observations it is well to have a large sheet of paper or cardboard, ruled in four columns, for the date, a drawing of the object, the place, soil, and position where the object was found, and any general remarks (Fig. 1). The results should be compared with last year's nature, weather, and thermometer charts, and conclusions drawn on such matters as—Why certain flowers are earlier or more plentiful this year than last; under what conditions special plants or animals flourish most.

Seeds should be grown on flannel in the classroom, and the children allowed to draw the different stages of growth as they observe them week by week. For this purpose each child should have a long strip of paper folded into a book, each page of which is divided into two—one for the drawing of a monocotyledonous seed, the other for that of dicotyledonous seed in a similar stage (Fig. 2). The advantage of this last hardly needs pointing out.

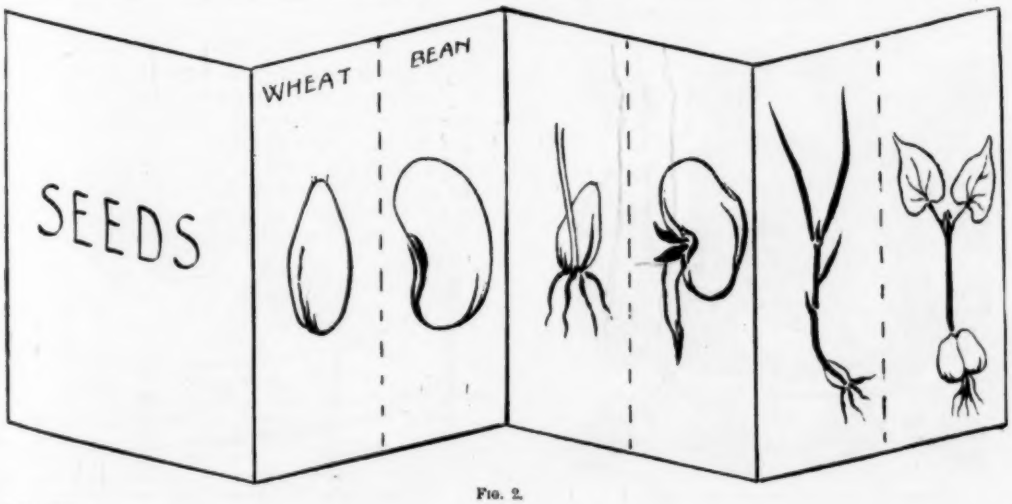


Fig. 2.

Bulbs can be grown in glass jars, and tubers against the glass side of boxes of mould, and the growth recorded by the children in the same way as that of the seeds.

Trees.—The study of trees is practicable even in crowded towns. The careful and exact study of one or two trees near the school is better than an attempt to observe the different features of many at once. This study is best commenced in the early spring, and the general contour of the skeleton of the tree, with its characteristic mode of branching, the special marking and texture of the bark, and the form of bud peculiar to the tree reproduced in brushwork by the children, the best painting being kept for the purpose of the permanent record. Then will follow observations on the bursting of the buds, the shedding of the scale leaves, the gradual expansion of the foliage leaves, the opening of the flowers, the slow development of the fruit, and the manner in which the seeds are scattered. All these observations should be recorded on the same big sheet of cardboard as time goes on, so that the life-history of the tree may grow before the eyes of the children.

School aquaria, both fresh and sea-water, afford opportunity for study of the development of many small animals. Breeding-cages for caterpillars are quite easy to keep. Collections that do not involve the destruction of life should be encouraged, while an occasional country walk with their teacher will do much to stimulate interest in nature, and to show the children where and how to look.

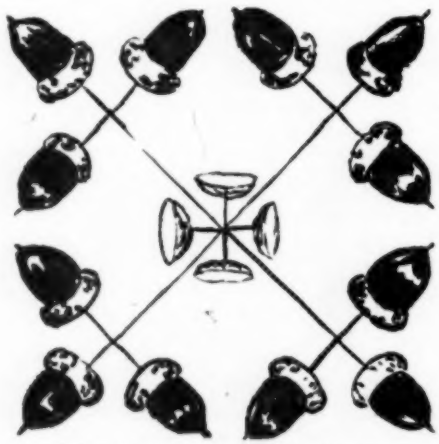
If these or similar methods are used in our infant schools, they will do much to produce alert, intelligent minds in our children, and to give them an interest that will endure throughout their lives, and thus prevent many of the evils, so prevalent in our time, that grow from empty minds and unoccupied leisure.

EXPLANATIONS AND SUGGESTIONS FOR CARRYING OUT THE CORRELATED SCHEME OF WORK FOR AN INFANTS' SCHOOL.

(Continued.)

November, Week I.

Clay Modelling.—It may be advisable to repeat last week's lesson, as the acorn is not a very easy object to model on a first attempt, and the children will thus have an opportunity of improving on it.



Week I.—Brush Painting: Acorn.

Brush Painting.—The design with acorns given in the accompanying illustration is merely a suggestion. There are, of course, many ways of dealing with the same subject.

Paper Cutting.—This exercise has been simplified as far as possible, but it is only suitable for those who have had considerable practice in drawing to attempt. The whole should first be drawn, and then cut out. The dotted lines in the illustration are intended to be filled in after the object has been cut, to give the contour of the animal. If the object should appear altogether too difficult, I should suggest a repetition of some object previously cut, such as the flower-basket, September, Week 2.

Week I.—Paper Cutting: Squirrel.

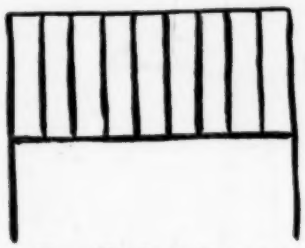
Blackboard Drawing.—This drawing is not likely to be very perfectly done by children of six years of age, but there seems no reason why they should not attempt it, if only for the sake of correlation and for impressing upon the mind of the child the way in which the squirrel uses the front paws as hands.

Week I.—Blackboard Drawing: Squirrel.

Crayon Work.—This is intended for reproduction by means of a copier, and then to be filled in by the children. The colours required are brown and green, the latter for the acorn held in the front paws.

Week I.—Stick Laying: Railings round Wood.

WEEK I.—CRAYON WORK: SQUIRREL.



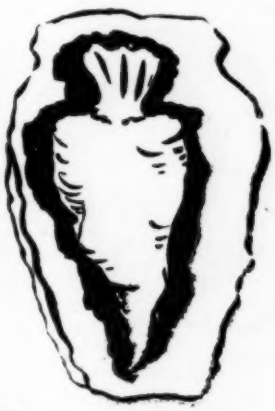
WEEK II.—STICK LAYING: RABBIT HUTCH.

WEEK II.—BLACKBOARD DRAWING: RABBIT.

Stick Laying.—This presents no difficulty. It is, of course, most suitable for a baby class.

November, Week II.

Clay Modelling.—The subject of this illustration, being a common food of the rabbit, is naturally correlated with a nature lesson on that animal. Take a piece of clay and roll it into a ball. Let the children well examine a carrot and describe the shape, leading them on to discover what must be done to the ball of clay to make it more similar in shape to the carrot. When the clay has been rolled so that it is more cylindrical in form,



WEEK II.—CLAY MODELLING: CARROT.

WEEK II.—PAPER CUTTING: CARROT.

show the children how to make it pointed at one end, while kept otherwise at the top. Be careful to point out that the carrot has no sharp edges, and show the children how to round them off with the fingers. Take some small pieces of clay to represent the stumps of

WEEK II.—BRUSH PAINTING: RABBITS IN FIELD.

the stalks at the top, and mark the carrot, as shown in the illustration, with a modelling knife or stick.

Brush Painting.—The illustration here given is effective, but quite easy if the children have really learned to use the brush in other strokes than blob making. Sepia or Vandyke brown would either of them be suitable colours.

Paper Cutting.—This may either be drawn first and then cut out, or, being fairly symmetrical, could be cut

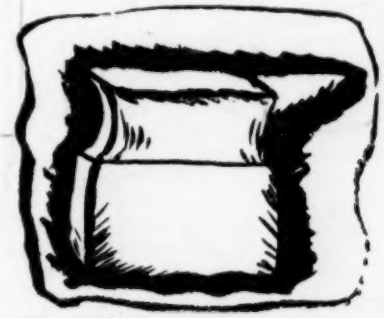
WEEK II.—CRAYON WORK: RABBIT EATING CARROT.

from a piece of paper folded in half. The former is preferable, a more realistic object being attainable by this means. The lines given in the illustration may then be drawn in in pencil.

The other illustrations given need no comment, except that in the case of the rabbit-hutch in stick laying it may be advisable to reduce the size, so that fewer sticks may be required.

November, Week III.

Clay Modelling.—This object must be modelled from the cube. The lower part is modelled first. Obtain the cylinder, and then the cube from that. The six surfaces are soon obtained by gently pressing first the ends of the

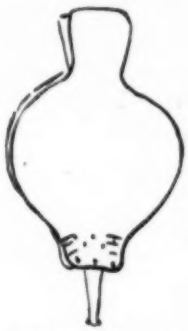


WEEK III.—CLAY MODELLING: ANVIL.

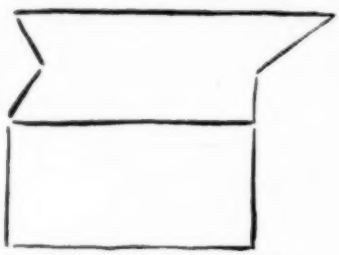
cylinder and then the two pairs of opposite sides on the modelling board over and over again. When the lower

WEEK III.—BRUSH PAINTING: HORSE SHOE.

WEEK III.—PAPER CUTTING: HAMMER.



WEEK III.—BLACKBOARD DRAWING: BELLOWS.



WEEK III.—STICK LAYING: ANVIL.

part of the anvil is completed, model the upper part in much the same way, but giving a curved appearance to the two opposite right and left sides. The point of the anvil must be added when the other part is finished.

WEEK III.—CRAYON WORK: BLACKSMITH.

If the children have not previously attempted a model of the cube, this object is unsuitable, and in that case I would recommend a model of the horse shoe. Roll out a piece of clay the length required, place it on the modelling board, and gently press flat with the thumbs into the required shape. Make the marks for the nails with a small stick or modelling knife.

Brush Painting.—Use sepia or Vandyke brown and paper squared to one inch. The horse shoe may be made to fit into four squares, and will in this way be easier for children to attempt the first time. On the second trial, skeleton lines forming a cross for the centre may be given, omitting the outer lines forming the square.

Paper Cutting.—Let the children draw this object first, and then cut out carefully with the scissors.

Blackboard Drawing.—This, being a symmetrical object, is not easy, but is a very good exercise in idea of proportion, and there is no harm in children attempting it, provided the difficulties do not discourage them.

Crayon Work.—This is intended for reproduction by means of a copier. The children fill in with colour.

Stick Laying.—There is no difficulty in this. Sticks of two sizes are required, and the teacher will do well to help the children by a drawing on the blackboard, as well as laying the object with sticks in front of them.

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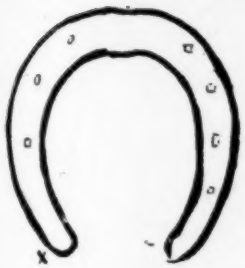
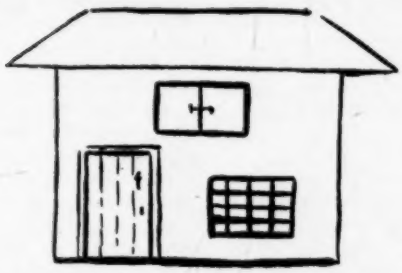
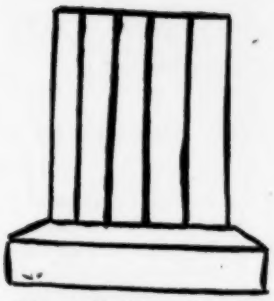


WEEK IV.—PAPER CUTTING: HORSE SHOE.



WEEK IV.—BLACKBOARD DRAWING: STABLE.



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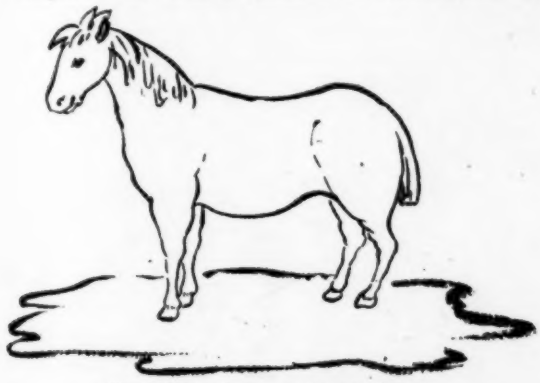

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ON SIMPLIFYING THE WORK OF INFANT SCHOOLS.

IT has become a very general impression among educationists of this country that one great fault of the English system of education of late years has been the crowding into the curriculum of the elementary schools subjects which should be left alone until the secondary school is reached. Owing to this system, the children attending our elementary schools have been receiving a superficial knowledge of many subjects, whilst "thoroughness" has been allowed to suffer; and to begin at the root of the matter, reform in the direction of simplification of the work of the infants' school is much needed.

While it is admitted by those most competent to form a judgment that the education given in the infants' schools of this country compares favourably with that given in most other countries, yet here also the fault occurs of sacrificing thoroughness for the sake of variety.

Most teachers of young children will readily agree that the lessons in the infants' school must not be too long (never more than half an hour), and must be as varied as possible, so as to prevent weariness either of body or mind. So far, so good. And if all mistresses of infants' schools had it in their power to do so, no doubt many an ideal syllabus would be framed, allowing ample time for instruction in the three R's (especially for reading), and at the same time introducing variety by means of singing, drill, object lessons, etc. But even mistresses of infants' schools are not allowed all their own way in this matter.

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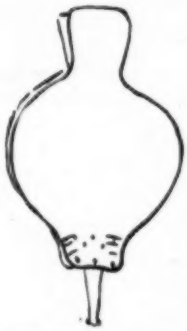

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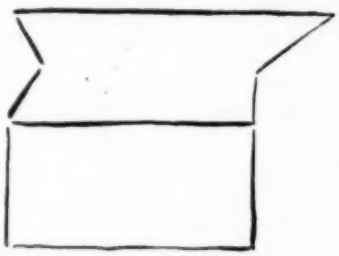

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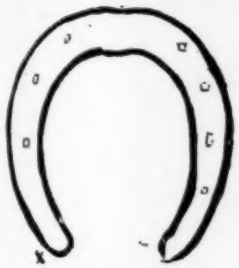

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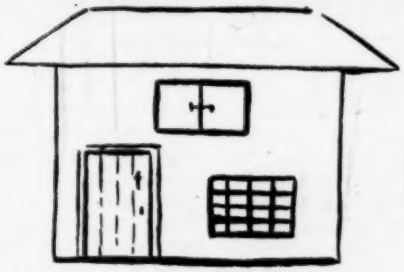

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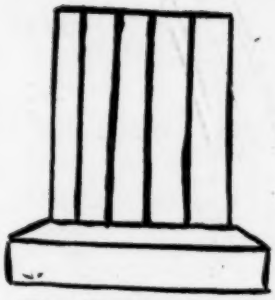

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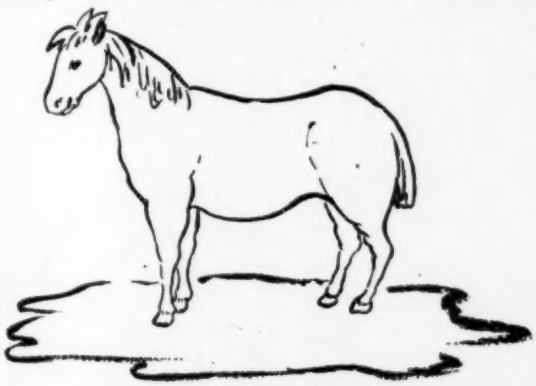

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Our Modern Language Section.

A SUCCESSFUL LANGUAGE TEACHER.

IT is not the privilege of every one to reside in London —at least, not up to the present—but the metropolis seems to be extending at such an alarming rate that it seems as though it will soon cover the United Kingdom. Such was the thought that came into our mind when we took the electric tram from Blackfriars Bridge through Brixton to the terminus at Streatham. This took us nearly to the confines of the area controlled by the London County Council, but we were not "out of town," and a short walk through a busy road took us to the Norbury terminus of the Croydon tramway system. The houses and shops seemed a little more crowded near Croydon station, but there was scarcely any intermission until we reached Purley, which is the southern terminus, after a run of about eleven miles.

The object of our pilgrimage was to seek an interview with Mr. A. E. Styler, whose contributions to the *Practical Teacher* have been so helpful to teachers and students of modern languages.

Mr. Styler may fairly rank as one of the pioneers of the "new method" in England, for with both voice and pen he has won many converts. French, when taught upon the old plan, was an incurably dull subject, and he has conclusively proved that a judicious application of the principles of the reformed methods will do much to render it interesting. He is no mere theorist, for his varied experience as a practical language teacher has brought him face to face with almost every kind of difficulty.

Mr. A. E. Styler.

He is familiar with the evening continuation school lad, whose intellectual status is often so low that he regards an unknown tongue as something ridiculous and contemptible, and who thinks that French is silly stuff or that German "sounds rubbish." He has struggled with the weary pupil-teacher, who, through overwork or the excessive number of "subjects," has come to regard each study as a means of winning marks in examinations, and who would never dream of trying to read a French masterpiece for amusement. He has faced the great class in the technical institute, the heterogeneous gathering of learners of every grade, from the student who has almost obtained his university degree down to the young person who scarcely knows what a participle is. Such work is valuable and stimulating training, for the very existence of the class depends upon the teacher's tact and skill.

Mr. Styler has enjoyed the sweets of success as well as the weariness of uphill work. It is pleasant to take up a moribund class and transform it into an enthusiastic and flourishing one. It is encouraging to receive presentations from students "as tokens of their appreciation of his unfailing courtesy and kindness in conducting the class, and of his personal interest in the progress of each student." And when, after the hard work of a session, a class carries off most of the modern language exhibitions offered for a whole county, the teacher feels that he is rewarded for his pains.

But amid all this striving after examination results, to which every teacher is driven in spite of himself, Mr. Styler has clung obstinately to the one great principle that "languages are learned by reading and talking." When he first stood before a technical institute class years ago, this idea was startling in its daring novelty. Now it is a commonplace which almost every one admits without argument.

Like all good teachers, he is in touch with his pupils and understands their needs. He can describe the diverse types of student and the different aims they pursue. As he enumerates only a few of them, one realises more thoroughly what a many-sided study a foreign language is. One student is vague; he takes up French merely for the sake of culture—"to improve his mind." Another is a clerk with no soul for anything loftier than business letters and office jargon. A third loves the language most for its literature, and wishes to widen his mental horizon by foreign reading. Some require a specialised literature: the doctor would like to read German medical works in the original, and the photographer is in haste to read the French journals of his trade. Lastly, every class contains a good percentage of teachers, who want all the information they can obtain on foreign methods and foreign holiday courses.

Mr. Styler was among the first to advocate minute attention to pronunciation and the study of phonetics. Nowadays there is a danger of over-elaboration, and some phoneticians need to be reminded of the plain fact that millions of people speak quite correctly without even knowing what effect is produced by the parallelism or non-parallelism of the vocal chords.

With regard to the application of the direct method to evening work, perhaps the best argument in its favour is that it is attractive; and when your students arrive weary after a day's hard work, "*toutes les méthodes sont bonnes, sauf les ennuyeuses.*" In the earlier years of

Mr. Styler's work in technical institutes the students used to form themselves voluntarily into summer classes, so that there should be no interruption of the work; and the demand for his services became so great that he had to refuse work on all sides. Then, in deference to authority, he modified the method to suit existing examinations, and at once distinguished himself as an examination coach. But this is not congenial work; he would prefer to be free and untrammelled. Examinations have been reformed to a great extent, it is true, and Mr. Styler has himself had the pleasure of acting as examiner in the practical *vivâ voce* tests now arranged; but the reforms do not go far enough, for examinations still hamper the work of the best teachers.

But practical teaching is only one side of Mr. Styler's work. In fact, he has always keenly felt the limitations of a teacher's lot—the narrowing restrictions, the belittling influences of routine, the lack of social consideration and independence. He has sought and found the corrective in foreign travel and the study of languages. Moreover, by undertaking at his own cost the propaganda of the holiday courses, he has probably induced hundreds of his fellow-teachers to follow in his track. His bold initiative and intense enthusiasm can be best understood from the fact that he has spent hundreds of pounds in attending the holiday courses of France, Switzerland, and Germany, having devoted no less than twelve holidays to study on the Continent.

Long before holiday courses had been thought of, he had formed the habit of solitary travel. Back in the eighties he was roaming about Normandy on the high bicycle of that day, living entirely among French people, and gaining a deeper insight into their modes of life and thought. In 1889 he spent a month in Paris, hobnobbing with the *rapins*, and studying the quaint life of the Quartier Latin. In 1897 he twice visited Normandy, and his first contribution to the *Practical Teacher* was the outcome of this visit—an article on the holiday courses at Caen. Since that time he has regularly visited the various courses as special correspondent, gaining a great store of valuable experience, observing the methods of professors of every possible type, and acquiring deep knowledge and practical skill as a linguist.

In 1898 and 1900 we find him studying German at Cologne, where he formed interesting foreign friendships, and gave instruction in English. In 1899 he attended the splendidly-organised courses at Geneva and Lausanne, and still retains pleasant memories of the kindly professors whom he met there. The great advantage for the English student in these more distant university towns is that there are so few English present. He is compelled to speak French and German all the time, and there is no temptation to speak English.

In 1901, with financial aid from the Surrey County Council, Mr. Styler visited the famous Dr. Rein at Jena, and spent a most enjoyable month there, afterwards contributing a series of articles to the *Practical Teacher*. He has many interesting tales to tell of his experiences there—the jolly student life; the stimulating lectures, meetings, and debates; the daily intercourse with people of almost every European nationality.

Of late years he has visited the holiday courses of Lisieux, Caen, Bayeux, Villerville, and Honfleur, and feels that there is now no further need to urge teachers to take up the study of foreign languages. Year by year new classes are founded, and the number of students is constantly on the increase.

During his travels Mr. Styler has heard and seen many types of professors, and one great principle which he has gathered from a long series of observations is that, except, perhaps, for the most advanced classes, the teacher should be of the same nationality as the pupils; or, failing that, he should possess a sound knowledge of their native language. Mr. Styler has heard French professors waste time, owing to their ignorance of English, in expounding certain prefixes which are common to English and French, and which therefore needed no explanation. He has noted that the same professors completely pass over the Englishman's special stumblingblocks, because they do not happen to be difficulties to a Frenchman.

On more than one occasion Mr. Styler has successfully worked up classes which had been failures in the hands of foreign teachers. On one such occasion a boy asked him a question which threw some light upon the question of discipline—another important phase of this subject. "Please, sir, what does *Taisez-vous donc!* mean? Our French teacher used to be always saying that." One can form a mental picture of that poor distracted Frenchman.

With regard to method, Mr. Styler thinks that a teacher ought seldom to adopt wholesale any one of the so-called methods, but rather lay down certain principles, and apply them as skilfully as possible according to circumstances.

Similarly, method for the individual student must necessarily vary greatly. He must choose between *pedantry* and *power*. If he be fated to wander in the mazes of philological detail, historical grammar, or even over-elaborated phonetics, he cannot hope to gain practical command of English, French, German, and Spanish.

Mr. Styler's success has evidently sprung from this great enthusiasm for his favourite studies. We heartily congratulate him upon his useful work in the past, and hope he may continue it for many years to come.

ON THE STUDY OF GERMAN.

V.

THERE are several difficulties in German construction which we have reserved for special treatment. These are the question of the cases governed by some verbs and groups of verbs, and by prepositions, together with the prepositions which should follow certain verbs.

Following the principles of comparison and contrast which we have adopted in the present series of papers, the student must observe that German is richer in case-endings than English. We have lost any special form for the dative case, although we still continue to use originally dative forms in some of the personal pronouns both as accusatives and datives. Our genitive case, too, has become merely a possessive case.

Both in German and in English there are *link verbs*—that is, verbs which link together two substantives denoting the same person and thing, or a substantive and an attribute referring to it. *Sein*, "to be," *werden*, "to become," and *scheinen*, "to appear," are verbs of this class; as, *Mein Sohn ist Kaufmann geworden.*

Some verbs in English are only link verbs when used passively, as *to be appointed, to be called*, etc.; as, He was appointed ambassador. Verbs of this kind in German, as *ernennen*, "to name," *erwählen*, "to choose," and *machen*, "to make," are followed by *zu* or *zum* (= *zu dem*) with a substantive denoting the office or rank to which a person is named, chosen, etc.; as, *Er wurde zum General ernannt.*

Just as in Latin and Greek, and to a less extent in French, some verbs which take a direct object of the person in English take a dative of the person in German. The student

who takes up Latin and French before taking up German will find no difficulty with many of these, as he will notice that the equivalent verbs in French or Latin, or both languages, also take the dative case. Instances of such verbs are *rathen*, "to persuade;" *abrathen*, "to dissuade;" *antworten*, "to answer;" *befehlen*, "to order;" *gefallen*, "to please;" *beistehen*, "to help;" *dienen*, "to serve;" *entgehen*, *entkommen*, *entrinnen*, "to escape;" *gehorchen*, "to obey;" *schmeicheln*, "to flatter;" *vorwerfen*, "to reproach," etc. Others, which have no analogies in French or Latin, are *fluchen*, "to curse;" *folgen*, "to follow;" *zuhören*, "to listen," etc. All that a teacher can do is to point out to the student such likenesses and differences, and to show how analogies drawn from other languages will make the rules of German construction less unfamiliar to him. The rest he must do for himself. Merely to learn a long list of verbs governing the dative is not of much help to the student. He should form a sentence or two for himself with each of these verbs, and, above all, should read systematically. If he follows the course recommended, he will find that he is as little likely to use the wrong case with such verbs as these as would a German himself.

Again, in German as in English, there are many verbs which, from the nature of the idea they express, take both a direct and an indirect object. In German, the indirect object is put into the dative. Most of the German verbs of this class correspond with the English verbs which are similarly used—as, *geben*, "to give," *schicken*, "to send," *zeigen*, "to show," etc.; but there are some, such as *anvertrauen*, "to entrust," *entreissen*, "to snatch," *nehmen*, "to take," *stehlen*, "to steal," and *verzeihen*, "to pardon," which do not. In French, the verbs which correspond with these take also a dative of the person and an accusative of the thing, so that, so far as the government of these verbs is concerned, our language is the one which follows an exceptional course.

Another class of verbs in German having a considerable number of representatives takes an accusative of the person and a genitive of the thing. Such verbs are *berauben*, "to deprive;" *anklagen*, "to accuse;" *versichern*, "to assure," etc. —as, *Er hat mich meiner Ehre beraubt.*

Many of these verbs, as *sich bemächtigen*, "get possession of," *sich erfreuen*, "to rejoice," *sich erbarmen*, "take pity on," etc., are reflexive. In this case the accusative is a reflexive pronoun; as, *Ich schäme mich Ihres Benehmens.*

(To be continued.)

FRENCH PRIZE COMPETITION.

RULES (as usual).

A Prize of Half a Guinea is offered for the best rendering into English of the following extract:—

Ne faisons-nous pas dans la vie un voyage terrible et sans relâche? N'est-ce donc rien que d'arriver successivement à tous les âges, d'y prendre et d'y laisser quelque chose? Tout ce qui nous entoure ne change-t-il pas chaque année? Chaque âge n'est-il pas un pays? Vous avez été enfant, vous êtes jeune homme, vous deviendrez vieillard. Croyez-vous trouver entre deux peuples, quelque éloignés qu'ils soient l'un de l'autre, autant de différences qu'entre vous enfant et vous vieillard? Vous êtes dans l'enfance; l'homme y a les cheveux blonds, le regard assuré et limpide, le cœur allègre et joyeux; il aime tout, et tout semble l'aimer; tout lui donne quelque chose, et tout lui promet bien plus encore. Il n'y a rien qui ne lui paye un tribut de joie, rien qui, pour lui, ne soit un jouet. Les papillons dans l'air, les bluets dans le blé, le sable des rivages, la luzerne des champs, les allées vertes des bois, tout lui donne des plaisirs; tout lui promet tout bas des bonheurs mystérieux. Vous arrivez à la jeunesse; le corps est souple et fort; le cœur noble et désintéressé. Là, vous brisez violemment vos jouets d'enfants, parce que vous trouvez alors de nouveaux jouets que vous traitez avec le même sérieux; c'est le tour de l'amitié, de l'amour, de l'héroïsme, du dévouement; vous avez tout cela en vous; vous le cherchez chez les autres. Mais ce sont des fleurs qui se fanent. Vous voici arrivé à la vieillesse. On y a les cheveux gris ou blancs, ou une perruque; les belles fleurs dont nous parlions y portent leurs fruits inattendus: l'incrédulité, l'égoïsme, la défiance, l'avarice, l'ironie, la gourmandise. Vous riez des jouets de la jeunesse, parce que vous en trouvez là encore d'autres que vous prenez encore au sérieux: les places, les croix, les cordons de diverses couleurs, les honneurs, les dignités.

ALPHONSE KARR.

RESULT OF THE OCTOBER COMPETITION.

The prize is awarded to "Lex." (Will "Lex" kindly forward name and address for publication?)

First Class.—Shakspere, E.S.L.A., Oakover, Quatre-vingt-treize, Fitzthomas, Bees, Gawayn, La petite, Theodore Vincent, Erin, Bracebridge, Eicarg, Antonia, Veronica, L.S.B., La Printanière, Edzell, Danella, Sigma, Strength, The Choctaw, Bassenthwaite, Theo, Friar Tuck, Norland, Adlitam, D'Arcy, Granite City, Day Dawn, Juvenis, Agaznog, Kirkby, Penchant, Tyro, Amœba, Westney, Klopstock, Eclito, Bozen, Butterbiggins, Pilatus Kulm, Nick, X.Y.Z., Yvonne, Zodiac, Welburn, Tom Brown, Bea, Bell Heather, Cristallo, Will Ernest, Anne, Automobile, Nemo, Jumbo, Awa Maru, Dot, E.J.D., Yvonne (B), Meriden, Clip.

Second Class.—Maiden City, Ecossais, Clio, Sans Souci, P.P.P., Bam, Birnam, Noremac, Grimbarian, S.L.M.S., Sans, Denise, La Sentinelle, Erin-go-bragh, E.M.B., Esmond, Sunflower, Odd Number, Dulce, F.J.W., Muirton, Albion, Era, Eva.

Received too late.—A.M.C., Muri, Trossachs, Cerddedwr.

The name and address of "Round Tower," the successful competitor in September, are:—Miss Nettie Roy M'Lellan, Garnock House, Pearse Street, Brechin, N.B.

Report.

Very few good papers have been sent in this time. Too many, instead of preserving the term *café* or translating it as "coffee-house," rendered it "public-house," "tavern," "smoke-room," "smoking-saloon," etc. The French *cafe* has an individuality of its own, but the rendering "public-house" or "tavern" tends to confuse it with an institution which is very different. So *dame du comptoir* was translated "barmaid," instead of "lady at the desk," or something of the sort. *Banquette* and *chope* led the thoughts of some competitors away to eating. The successful competitor, in his rendering of *salle* as "dining-saloon," has not escaped this misapprehension.

Prize Translation.

It was an inveterate habit of the captain to frequent a coffee-house. There he satisfied at once his love for tobacco, absinthe, and cards—the three vices equally dear to his heart. Almost the whole of his existence was spent there, and he could have drawn up a plan of all the towns where he had been quartered, according to the taprooms, tobacconists' shops, cafés, and military clubs in each. He never felt really comfortable except when seated on a well-worn velvet bench, in front of a green tablecloth, near which was an accumulation of tankards and platters. He never failed, after hanging up his sword and his cap on a peg, and seating himself, as he loosened several buttons of his coat, to heave a deep sigh of relief, and to exclaim, "This is all right." His first care, therefore, was to seek for the establishment to which he should resort, and after making a round of the town without finding any place to his liking, he fixed his practised eye on the Café Prosper. This place was not his ideal. Outwardly it presented several features which were much too provincial; but the interior pleased the captain. He was delighted, on his entrance, by the tinkle of the bell which was touched by the lady in attendance, who wore a light-coloured dress and a scarlet ribbon in her well-pomatumed hair. He noticed that the dining-saloon was cheerful and clean, the floor evenly strewn with yellow sand; he walked round it, looked in the mirrors at his passing figure, gave his order, had a smoke, found the lounge soft and the absinthe well-flavoured, and was tolerant enough not to grumble at the flies taking their dip in the liquors with quite rustic familiarity. Eight days after, he had become one of the props of the Café Prosper. LEX.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Late Principal of the Belvedere Pupil Teacher Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP COURSE FOR DECEMBER 1904.
Eleventh Month—November.

Work to be Prepared.

1. *Reading and Repetition.*—Regular systematic practice if the examinations have not been already taken.

2. *Teaching.*—Chaps. xi., xii., and xv., *Scholarship School Management.*

The teaching of object lessons, science, and drawing is sufficiently described in the text-book; but I want all students to study most carefully what is said in chap. xv. on the writing of notes of lessons. Now that there is no separate paper on school management, the questions which are set in the various papers on teaching, and which, by-the-bye, are generally compulsory, usually take the form of writing either full or outline notes for a lesson on some particular topic connected with the subject of the paper. It may be stated as a general fact that it is harder to write a good set of notes than to give a good lesson. It frequently is the case that, where a student has compiled a set of notes and then gives the lesson, the notes are widely departed from because they are altogether impossible. In every lesson the first point is to decide clearly what is to be taught, taking into consideration the age, previous attainments of the class, and also what facts will be useful. A lesson on water to Standard I. would be very different from one on the same subject to Standard VII. It is useless to endeavour to teach facts which are beyond the mental capacity of the children. Having decided on the facts, the next great point is the *method* of teaching. This varies with every class and subject, but some general principles may be laid down which will be of service. In arithmetic, grammar, and elementary science, the best method is nearly always induction—that is, reasoning from suitable examples up to the establishment of a general rule or definition. Thus in a lesson on intransitive verbs the procedure should be as follows:—(1) The collection of twenty or thirty simple sentences, some containing transitive and some intransitive verbs; (2) the careful examination of the sentences under the teacher's guidance, to determine where the sense is completed by the verb, and *vice versâ*; (3) the arrangement into two classes; (4) the induction of the definition. This must come last. And so in arithmetic any new rule must be induced either from previous knowledge or from suitable examples. *Telling* is not *teaching*. The class must be helped just sufficiently to help themselves. Destroy all effort, and you destroy all interest. The great temptation to the unskilful teacher is to make up for deficiency of skill by superfluity of facts, and to propose to teach in one half-hour what would beneficially employ the greater part of a week.

It will be seen that every lesson requires much thought. It is impossible to lay down any stereotyped plan or slavishly adhere to any set form. Originality of treatment is needed. One of the most striking though not very artistic lessons I ever heard was given by a young teacher on the fall of Jericho. He imprisoned a boy inside three blackboards, formed a small procession with penny whistles, Jew's harps, etc., to march round seven times, and shout. After the seventh perambulation and shout, the boy inside pushed the blackboard down, and engaged in a fine scuffle with the attacking force, to the huge delight of the rest of the class. This may not be "high art," but it was effectual in impressing the facts on the memory of the class. The same teacher also defined "kinetic" energy by a vigorous downward sweep of a cane on a boy's hand, naïvely explaining that what energy he had lost the boy had gained. Though such methods may be open to criticism, it would be a good thing if teachers would try to make their lessons and facts as forcible. One other instance of the same teacher (teacher no longer, for his energies could not find sufficient scope in school). From the master's pewter inkstand, a few handfuls of wet clay, and a forceful squib, he gave a fine illustration of a volcanic display, the melting inkstand supplying the unexpected part of molten lava. In each case there was a very commendable and hearty desire to do his best by the class at the expenditure of some preparation and thought, and this is the keynote of success in giving a lesson.

3. *Drawing.*—Continue the regular practice, which alone makes perfect. Let your freehand be veritable *free* hand—bold, sweeping curves combined with neatness and accuracy of finish.

4. *Music.*—Work the following paper:—

(1.) Rewrite the following in the "imperfect method"—

Key E♭. Key B♭. t. f. E♭.

m s m r d t $_{r}$s$_{l}$ l$_{t}$ t$_{l}$ d t$_{l}$ ^{d}s l d^{l} l s f r d

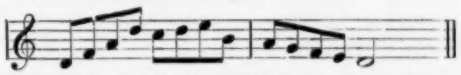
(2.) Write the following intervals:—

(a) Augmented fourth above **d**.
(b) Minor third above **s**.
(c) Major sixth above **m**.
(d) Augmented second above **ma**.
(e) Diminished seventh above **fe**.
(f) Major third above **l**.

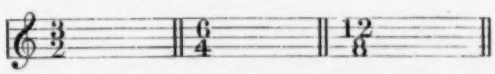
(3.) What would that note which is *fe* in the key of C be in the following keys?

(a) B♭. (b) B. (c) D. (d) E♭. (e) G. (f) A.

(4.) To the following passage, written three times, add the sharps, flats, or naturals before each note necessary to put it into the keys of (a) D minor (harmonic); (b) G minor (harmonic); (c) D major (harmonic) respectively.



(5.) Fill up the following bars with quavers grouped according to the accent in the following times:—



5. *Penmanship.*—Ten minutes' daily practice from a good model, and great care at all times. Some system must be adopted and adhered to. It is not an infrequent experience to see a copy submitted for marking with the same letter made in two or three different ways.

6. *Composition.*—Write one or two essays each week on such subjects as:—

(a) Genius.
(b) The character of dogs.
(c) The significance of geographical names.
(d) Wireless telegraphy.
(e) The character of Benedick.
(f) Border warfare.
(g) Sports in Tudor times.
(h) The character of Queen Elizabeth.

Read up the subject if necessary, arrange your facts in proper sections, write a rough draft, and then polish into shape.

The following notes may be useful:—

(a) Genius has been defined as "the capacity for taking infinite pains." This is incomplete. There must be a great natural aptitude coupled with the strength of will necessary to take the pains. One without the other is useless. Many a one with a strong talent for music never makes a name because of the lack of determination, and many a one may practise for fifteen hours a day without becoming in any way a genius.

(b) Little difficulty should be experienced with this. Animals have far more character than we give them credit for. Numerous incidents will occur to the student to illustrate the essay with.

(*c*) This is a very fascinating study. It is very difficult to take the names of old towns and villages and examine their etymology without meeting with most interesting information. Probably local instances will readily be found.

(*d*) This is a technical subject, but one which every studen should know something about. In ordinary telegraphy the elec tric current is sent along copper wires; in wireless telegraphy waves are set up in the ether, that theoretic impalpable substance which pervades everything, and by means of which light and heat are conveyed to us across infinite space. The two essentials are (1) apparatus to start the wave—a strong electric discharge or spark; (2) a receiver which is affected by the wave in such a way that the message may be recorded.

(*e*) This is a question on the play, and the ability to write a good essay will depend upon the extent to which the play has been studied. There is a good sketch in the text-book recommended, but it is much preferable to write originally from private and thoughtful study.

(*f*) *The Lay of the Last Minstrel* affords ample material for this.

(*g*) See *Kenilworth*.

(*h*) A very likely subject. Elizabeth possessed a somewhat complex character, made up of strong opposites and contrasts. An admirable statesman, but a despicable woman; strong in some things, weak in others; fearless of criticism in national policy, with more than the feminine greed of praise for good looks and dress. *Kenilworth*, again, will supply much material for an essay on this subject.

(In order to see exactly how a subject should be analysed and arranged before the essay is commenced, I would strongly advise all readers to get *Composition in Schools and Colleges*, by C. H. Maxwell (Meiklejohn and Holden), price 1s. An excellent little manual on this subject.

7. *English.*—(*a*) Twenty-five roots and meanings per week.

(*b*) Revise the first half of the play. The text should now be fairly familiar, and special attention should be given to the notes. Be prepared to write a sketch of any of the leading characters, with quotations to prove the qualities you ascribe to them. A life of Shakespeare should also be known, together with the attributes which make him the greatest dramatist of his own or any other age—his wonderful knowledge of human character, and his power of characterisation, his "many-sided" views of life, his exquisite use of language, his entire self-suppression.

(*c*) Revise the grammar of the parts of speech. Notebooks, if properly kept, should now be of valuable assistance.

(*d*) Revise the history of the language up to the Renaissance, noting particularly the changes consequent upon the Conquest.

8. *Geography.*—(1.) Revise the British Isles.

(2.) Learn the chief steamer routes of the world, and the approximate times taken to reach the chief ports in the colonies and foreign countries.

(3.) Pay special attention to commercial geography, particularly as it affects the mother country and the colonies. You should know exactly whence come our supplies of—

(*a*) Food stuffs.—(i.) Cereals: corn, maize, wheat, etc. (ii.) Wines. (iii.) Animal products—meat, alive or frozen or preserved; butter, cheese, eggs, etc.; fish. (iv.) Spices and colonial produce—for example, tea, coffee, sugar, cocoa.

(*b*) Raw materials for manufactures.—(i.) Woods: pine, elm, oak, maple, mahogany, ebony, teak, etc. (ii.) For textiles—for example, cotton, linen, woollen, silk. (iii.) Metals—for example, iron, steel, copper, tin, lead, quicksilver, etc.

(*c*) Manufactured goods—for example, silks, fancy goods, toys, machinery, etc.

(Messrs. Meiklejohn and Holden have just published a little book containing all the questions set in geography in all the public examinations for many years. This will be found of infinite assistance in revising.)

9. *History.*—The reign of Queen Victoria. The chief points to notice are:—

(1.) The enormous extension of the empire.

(2.) The Crimean War: its causes, events, and results.

(3.) The Indian Mutiny: its causes, events, and results, especially the transference of the government to the crown.

(4.) The repeal of the Corn Laws, and era of free trade.

(5.) The enormous advances in social legislation.

(6.) Lives of the chief statesmen.

In addition to the above, the history should be revised as far as 1603. Many students do not know how to set about revising. It is not necessary to wade through the whole of the text-book again, but certain lines may be taken: for example, prepare a list of statutes with dates and terms; a list of wars, battles, and treaties; a list of the men whose biographies should be known; the growth of the House of Commons; the gradual decrease in the feudal system, etc. If you think these are known, take the index of your text-book and run your eye down the names; and if any occur of which you know nothing, turn them up in the text. A companion question book to that mentioned above is published, and should be of great service in showing the style and scope of the questions set.

10. *Arithmetic.*—Revise the theory of arithmetic. Learn exact definitions and proofs of rules.

Work the following paper:—

(1.) Illustrate by a diagram, or by the pence table, or by any ther means, that $\frac{2}{3}$ of $\frac{3}{4}$ is $\frac{1}{2}$, and prove generally that the value f a fraction is not altered if its numerator and denominator are multiplied by the same integer.

(2.) Define factor, common factor, prime number, and odd number. How many numbers between 1,000 and 10,000 are exactly divisible by 29?

(3.) Determine whether it is true that 5d. : $2\frac{1}{2}$d. :: $2\frac{1}{2}$d. : $\frac{1}{2}\frac{1}{0}$d.

Prove that by adding a farthing to one of the three sums 1s. $3\frac{1}{2}$d., 2s. $2\frac{1}{4}$d., 3s. $7\frac{3}{4}$d., we can make the second a mean proportional between the other two.

Also without multiplying out prove that there is *only one* of the three sums to which a farthing can be added with this result.

(4.) A ship's cargo is unloaded by 27 barges of equal size, each barge taking 3 loads; but if each barge had contained 170 tons more, it would have had only one load. Find the weights of the cargoes of ship and barge respectively.

(5.) Find the value in £, s. d. of $\frac{1}{\cdot 0375}$ of 2s. 3d. + ·246875 of £3 − ·875 of 15s. 6d.

(6.) A man whose capital is in 3 per cent. stock sells out, and invests the capital thus realised in 4 per cents. at 128. The income from the new stock exceeds the income from the old by $7\frac{1}{2}$d. in the pound. At what price did he sell?

(7.) The area of a square is $\cdot 1\dot{3}$ square inches. Express in inches the breadth of the square as correctly as you can by a decimal of two places only, explaining why you alter a figure in the square root.

If the square were formed having the exact breadth denoted by your result, by how much per cent. would the area of one square exceed the area of the other?

(8.) An oblong room is 20 yards long by 13 yards broad. It is to be covered as far as possible with carpet 2 feet 3 inches wide, which may not be cut lengthwise. Robinson proposes to lay all the lengths of carpet along the room; Jones proposes to lay them *across* the room. The difference in carpet value between these two methods is 6 shillings. At what price is the carpet sold per yard of length?

Notes on solutions:—

(3.) Second part. The quantities reduced to farthings are in proportion 62 : 105 : 175. For the second to be the mean proportional to the others, its square must = product of first and last. If the second is altered, its square will not contain the factor 5, but the product of first and last will. If the third is altered, the product will not end in 5, but the square of the mean will. Therefore the first must be altered, and $\frac{105^2}{175} = 63$.

(4.) If each barge took 170 tons more, it would have two journeys less. Therefore it takes $\frac{1}{2}\frac{7}{0}^{0} = 85$ tons.

(6.) $7\frac{1}{2}$d. = $\frac{1}{3\frac{1}{2}}$ of £1.

If the income in the first case were 32, in the second it would be 33. In the second case the man gets $\frac{1}{3\frac{1}{2}}$ of his money back, or $\frac{1}{3\frac{1}{2}}$. Then as 33 : 32 :: $\frac{1}{3\frac{1}{2}}$: $\frac{1}{3\frac{1}{2}}$. In the first case he gets $\frac{1}{3\frac{1}{2}}$ of his principal as interest. As the interest is £3, the principal must be £99.

(7.) The square root of $\cdot 1\dot{3}$ is ·3651. Expressing as correctly as possible in two figures, this would be ·37, for 651 is nearer 700 than 600, etc.

(8.) Robinson would be able to lay 17 strips 60 feet long = 1,020 square feet. Jones would be able to lay 26 strips 39 feet long = 1,014 square feet. There is a difference of 6 square feet, producing a difference in cost of 6 shillings. The carpet is 1s. per square foot. In a yard of carpet there would be $3 \times 2\frac{1}{4}$ square feet = $6\frac{3}{4}$ square feet at 1s. = 6s. 9d.

11. *Algebra.*—Revise any weak point, and work as many test papers as possible, such as those in Hall and Knight's little book of test papers.

12. *Euclid.*—Revise the second half of Book I., with ten deductions per week.

13. *Elementary Science.*—Finish the chemistry section, and revise as far as possible.

14. Read up answers to one or two of the papers in the books of questions used.

Test Paper in General Information.

1. When were surnames introduced, and from what were they derived?

2. Where would a person have no shadow on December 21, March 22, and June 21 ?
3. What are the causes of the seasons ?
4. Complete the following quotations :—
(*a*) "A little learning....."
(*b*) "The better part of valour....."
(*c*) "'Tis distance....."
(*d*) "A thing of beauty....."
(*e*) "One touch of nature....."
(*f*) "The paths of glory....."
5. What is the Aurora Borealis ?
6. "The value of our imports exceeds by £150,000,000 the value of our exports." How do you account for the prosperity of England under such conditions ?
7. Why does the mercury in a barometer rise and fall ? What can we deduce from this ?
8. What are cyclones and anticyclones ?

Test Paper in Euclid.

(Time, 2 hours. All questions may be answered. Marks are given for parts of questions.)

1. Define a plane rectilineal angle, an obtuse angle, an isosceles triangle ; and distinguish between an axiom and a postulate.
From a given point to draw a straight line equal to a given straight line. (Take a case where the point is in the given straight line.)
2. If at a point in a straight line two other straight lines on the opposite sides of it make the adjacent angles together equal to two right angles, these two straight lines shall be in one and the same straight line.
PQR, PQS, RST, RSV are equilateral triangles. Show that TP, PQ, QV are in the same straight line.
3. If two triangles have two angles of the one equal to two angles of the other, each to each, and one side equal to one side, these sides being opposite to the equal angles in each, the two triangles are equal.
The sides PQ, PR of the triangle PQR are produced to S and T, QV, RV bisect the angles SQR, TRQ. Show that PV bisects the angle QPR.
4. From O any point within the acute-angled triangle PQR perpendiculars are drawn meeting QR in L, RP in M, PQ in N. Show that the sum of the squares on PN, QL, RM is equal to the sum of the squares on NQ, LR, MP.
5. If a straight line be divided into any two parts, the squares on the whole line and on one of the parts are together equal to twice the rectangle contained by the whole line and that part, together with the square on the other part.
What is the corresponding algebraical formula ?

History.

(One and a half hours. Answer *four* only of the following ten questions.)

1. State concisely the work done in legislation by two of the following—Henry the Second, Edward the First, and Henry the Eighth.
2. Point out as clearly as you can the effects upon the feudal system of the following—(*a*) scutage ; (*b*) Villeins' Revolt ; (*c*) Wars of the Roses.
3. What do you know of two of the following ?—Godwin, Hereward, Algernon Sidney, John Wilkes.
4. Contrast the rule of the Tudor monarchs with that of the Stuarts.
5. Point out what important *results* accrued from the following battles (no description is required)—Bouvines, Agincourt, Blenheim, Leipzig, the Nile.
6. Explain clearly how you would teach a Standard V. a battle—for example, that of Poictiers or Bannockburn. (Your method must be fully explained. No credit will be given for mere facts.)
7. Point out in English history any measures taken to ameliorate the condition of the poor, and state to what extent they were successful.
8. Trace any connection you can between (*a*) the loss of the American colonies and the settlement in Australia ; (*b*) the Black Death and the Peasants' Revolt ; (*c*) the invention of printing and the Renaissance.
9. Name any six women who have exerted an influence upon the history of England, and give a brief account of *two* of them.
10. Give the successive steps by which the House of Commons acquired its present power.

Geography.

(One and a half hours. Answer *five* of the following questions, illustrating your answers where possible by a sketch-map.)

1. Point out the results which you would expect to follow from an import duty being placed on food-stuffs supplied by other countries than our colonies—(*a*) on the colonies themselves, (*b*) on England.
2. Give six examples of towns which owe their present importance to their geographical position, and show in each case why this is so.
3. What were the objects, and what will probably be the results, of the recent expedition to Tibet ?
4. Where and what are the following, and how are they connected with British history ?—Arcot, Salamanca, Quebec, Saratoga, Khartoum, Uganda, Scutari, Yorktown.
5. Mention six rivers which are great highways of communication, and mention in each case the character of the goods sent up or down them.
6. Give some account of the methods by which our colonies are governed. In what respect does India differ from the colonies ?
7. Say what you can of the climate, productions, and towns of the British West Indies.
8. Where are the following places, and what do you know of them ?—Simla, Vladivostok, Caracas, Haiti, Lhassa, Pittsburg, Herat, Crete.
9. Detail the quickest route by which a person can get round the globe, and give the approximate times taken by the various stages of the journey.
10. Enumerate the chief islands in the East Indies. Mention their chief towns, and the character of the imports and exports.
11. Describe exactly how you would give a lesson to Standard VI. on Malta, or Gibraltar, or Jamaica.

General Elementary Science.

(Two hours. Answer *four* questions in Section I., and two from Section II.)

Section I.

1. A man tows a boat upstream by two cords—one attached to the bow, and one to the stern. Of what advantage is this arrangement ? Show by a diagram the forces acting upon the boat.
2. What do you understand by mechanical advantage ? Give instances in which pulleys may be employed (*a*) for convenience only, (*b*) in order to gain mechanical advantage.
3. A lighted candle is held (*a*) in front of, (*b*) behind a sheet of white paper, in the centre of which a grease stain has been made. Explain what you would see on looking at the paper in each case. The same sheet is now held vertically between two lighted candles, and in a certain position the grease stain cannot be detected by the eye. Why is this ?
4. An incautious experimenter uses granulated zinc and hydrochloric acid in a flask fitted for collecting the issuing product. He immediately applies a light to the end of the collecting tube, and the flask explodes. What has happened ? What should he have done to avoid the accident ?
5. Give an account of the changes which occur to the following substances on exposure to air—(*a*) strong sulphuric acid, (*b*) spirits of wine, (*c*) caustic potash, (*d*) iron filings.
6. What is a dipping-needle. For what purpose would you employ it ? How could you satisfy yourself that the dip was not due to the gravitational action of the earth ?

Section II.

7. How would you prepare crystals of sulphur from flowers of sulphur ? What experiment would establish the chemical identity of the various forms of sulphur ?
8. In what form does hydrochloric acid exist under ordinary atmospheric conditions ? What happens when hydrochloric acid comes into contact with (*a*) a solution of lead, (*b*) nitric acid, (*c*) bleaching-powder, (*d*) metallic sodium ?
9. What is an oxidising agent ? In what sense are the following substances to be regarded as oxidising agents—(*a*) chlorine gas, (*b*) nitre, (*c*) water ?
10. $8NH_3 + 3Cl_2 = 6NH_4Cl + N_2$.
What facts and what theories are expressed by the symbols employed in this equation ?

PUPIL TEACHERS' COURSE.

For Entrance Examination, 1905.

1. *Reading and Repetition.*—Regular oral practice is very necessary.
2. *Penmanship.*—Write a page daily in the *Practical Teacher Copy Book*, and use the greatest care at all times.
3. *English.*—(*a*) *Lay of the Last Minstrel*, Canto III. Prepare

stanzas 1-12. Be prepared to give the meaning in your own words, to analyse any part, and parse any word. Learn the meanings of all allusions.

(*b*) Learn ten roots and meanings per week.

(*c*) Learn the Greek prefixes.

(*d*) Revise the grammar and syntax of the parts of speech.

4. *Geography.*—Prepare thoroughly the geography of France and Germany.

Draw sketch-maps, insert all names to be remembered, and practise till thoroughly known. Both countries are very important. The productions, imports, and exports must be well studied; the courses of the chief rivers and railways; the positions and importance of the large towns. The government of Germany needs special attention. It is a federation of states, each possessing a certain amount of local control, but all combined for purposes of taxation, army and navy, etc.

5. *History.*—Edward the Third and Richard the Second.

Chief points:—

Edward the Third.—(*a*) The Hundred Years' War. The causes of this must be thoroughly understood. The help given by the French to the Scots, the marauding expeditions of the French against the south coast, the conflicts which occurred between sailors, all produced a feeling of hostility which the dispute about the wool trade with Flanders fanned into a flame. The cities of Flanders had risen against the Count of Flanders, who, unable to reduce them to submission, called upon the King of France to assist him. As Flanders was the chief market for English wool (then the staple export), had the French obtained supremacy there the trade would have been checked. To secure the open market the English king went to war. The claim to the French throne was put forward afterwards. Note the chief battles, and learn plans, and also the terms of the Treaty of Bretigny.

(*b*) The Black Death and Statute of Labourers. This is very important from the effects on the social condition of the poor, as will be seen from the revolt in the next reign.

(*c*) The misrule at the end of the reign, and the Good Parliament.

Richard the Second.—(*a*) The Peasants' Revolt. This was a protest against the position into which the villeins had been forced. The Black Death, Statute of Labourers, teaching of Wycliffe, heavy taxation for the French wars, and especially the iniquitous poll tax, goaded the peasantry to make an effort to secure money rent instead of personal service, freedom from unjust market dues, and the abolition of villenage. The events and results must be noted.

(*b*) The Lords Appellant and the Merciless Parliament.

(*c*) The deposition and death of the king.

6. *Arithmetic.*—Simple and compound practice. Invoices and bills.

7. *Science.*—The inclined plane, the wedge, and the screw. Notice especially the practical application of these powers.

8. *Music.*—Transcription from one key to another in staff notation.

Test Questions.

1. Write as specimens of copy-setting:—
   Large hand.—*Typewriting.*
   Small hand.—*Now fades the glimmering landscape on the sight.*
2. Analyse the following, and parse words in italics:—

> "The baron's courser pricks his ears,
> *As if* a distant *noise* he *hears*;
> The dwarf waves his long, lean arm *on high*,
> And signs to the lovers *to part* and fly."

3. Give the force of the prefix in the following words, and give other examples—spend, enormous, accede, pellucid, ignoble, coagulate, suppress, combustion.

4. What do you understand by the Great Central Plain of Europe? Give a general description of its extent and boundaries, its climate and productions.

5. Enumerate the chief islands in the Mediterranean Sea, and give a detailed account of one of them.

6. Under what circumstances did Edward the First interfere in Scottish affairs, and with what results?

7. Describe with a plan the battle of Bannockburn, and explain clearly why the stronger army was beaten.

8. Work the following:—

(1.) The wheels of a locomotive are 2½ metres asunder, and the inner wheel describes the circumference of a circle whose radius is 120 metres. Find the difference of the lengths of the paths of the wheels, having it given that the circumference of a circle equals 3·1416 times its diameter. Ans. 15·708 metres.

(2.) If a metre = 39·3708 English inches, show that 16 kilometres = 10 English miles nearly.

(3.) One pound avoirdupois = 7,000 grains troy, and a gramme = 15·434 grains. Show that 10 kilogrammes = 22 lbs. avoirdupois nearly.

(4.) A merchant lays out £1,000 in buying cloth in England at 3s. per yard. He takes the cloth to France, at an expense of 3d. a yard, and pays a duty of ·42 centimes a metre. He sells half at 8 francs a metre, and the rest at 6 francs a metre. What profit does he make (25 francs = £1; 1 metre = 39⅜ inches)?
Ans. £520, 18s. 8d.

9. How are pulleys used—(*a*) for convenience only, (*b*) for mechanical advantages. Draw a diagram to show how a weight of 6 lbs. may be balanced by a weight of 1 lb.

10. Write four bars of ¾ time and four of ⅝ time, varying the contents as much as possible.

Second Year's Course.

1. *Reading and Repetition.*—Regular daily practice before a competent critic.

2. *Penmanship.*—Write a page each day in the *Practical Teacher Copy Book*, and use great care at all times.

3. *Drawing.*—One or two freehand copies each week.

4. *English.*—(*a*) Goldsmith's *Traveller*, lines 316-375.

The author now proceeds to examine how far England provides the conditions of happiness. Its climate and vegetation are beautiful, but present neither the luxuriance of the tropics nor the stunted growth of the polar regions. The people themselves are the "lords of creation," characterised by independence, clear and bold thought, pride in their liberty. But while Britain may claim to exhibit liberty in its fullest extent, yet even this may be carried so far as to produce ills. Each individual is so proud of his independence that there is little social combination. Each stands alone, and regards others not agreeing with him as enemies. This naturally leads to friction, disputes, and arguments, till the dissensions threaten to destroy all the advantages accruing from liberty.

And a further evil may be dreaded. When each man thinks of himself and not of others, thus severing all the natural laws which bind him to his kind, he is apt to devote himself to an inordinate greed of wealth, which destroys all noble feeling, and the nation thus affected will not be disposed to support the painter, poet, author, who supplies material for higher and nobler thought, and thus a very low level will be ultimately reached.

(*b*) Learn carefully definite rules for punctuation.

(*c*) Learn fifteen roots and meanings per week.

5. *History.*—The reign of Victoria. For chief points see Scholarship Course.

6. *Geography.*—The geography of Australia.

Learn a memory map, insert names of all places to be remembered, and practise till known. The industries, imports, and exports require special study, and also the government of the individual states, and the central government of the Commonwealth.

7. *Arithmetic.*—Compound interest, stocks and shares. Study carefully the advice, and especially the model solutions, given in the text-book. If any difficulty is experienced, students should write for assistance.

8. *Elementary Science.*—Revise the chapters on light. Be prepared to answer any of the questions set at the end of the various sections.

9. *Euclid.*—Props. 9-12, Book II., with four deductions per week.

10. *Algebra.*—General exercise in indices and surds. Note especially the method of working out surd equations. The principle is to square each side and separate the surds to one side, and the definite quantities to the other. Square again, and repeat the operation till all the surds are eliminated.

Test Questions.

1. Write as specimens of copy-setting:—
   Large hand.—*Trypograph.*
   Small hand.—*There, Freedom, thine the blessings pictured here.*
2. Give in your own words Goldsmith's estimate of the Dutch character.
3. Analyse the following, and parse the words in italics:—

> "Nor this the *worst*. *As* nature's ties decay,
> As duty, love, and honour *fail* to *sway*,
> Fictitious bonds, the bonds of wealth and law,
> *Still* gather strength and force unwilling awe.
> Hence all obedience bows to these *alone*,
> And talent sinks and merit weeps *unknown*."

4. Point out exactly why reform was urgently needed in 1830, or say what you can of Roman Catholic emancipation.

5. Where and what are—Arica, Titicaca, El Gran Chaco, Potosi, Guayaquil, Sorata, Aconcagua, Rio Negro?

6. Work the following :—

(1.) The excess of the present value of a sum due in one year, reckoning interest at 5 per cent. over the present value, when interest is 6 per cent., is 10s. Find the sum. Ans. £55, 13s.

(2.) If the discount on a certain sum of money, due fifteen months hence, be £6, 4s., find the amount, rate being 5 per cent. Ans. £105, 8s.

(3.) If a person give £255, 5s. in exchange for a bill of £280, 15s. 6d., due a year hence, at what rate per cent. is he discounting the bill? Ans. 10 per cent.

(4.) Show that the difference between the interest and the discount on the same sum for the same time is the interest of the discount.

7. What are isogonic and isoclinic lines? Why do they not follow parallels and meridians? Explain the construction and the use of the dipping-needle.

8. Give an account of the changes which occur to the following substances on exposure to air—(*a*) strong sulphuric acid, (*b*) spirits of wine, (*c*) caustic potash, (*d*) iron filings.

OUR CERTIFICATE COURSE FOR 1905.

BY GEORGE COLLAR, B.A., B.SC.,

Head-master of the Stockwell Pupil-Teacher School.

TEST QUESTIONS ON LAST MONTH'S WORK.

Theory of Teaching.

1. Give a list of ten words that present difficulties in spelling. Say from what the difficulties arise and how you would get over them.

2. In what ways does a dictation test differ from a dictation lesson? Describe in detail the steps you would take in giving a dictation lesson.

English.

1. Give an account of *Sir Roger in Town* or *Sir Roger at Westminster Abbey*.

2. Write an outline of the third act of *Richard the Second*.

3. Explain the phrases, "*fretted us a pair of graves*," "*wanting the manage of unruly jades*," "*this small model of the barren earth*;" and the words *occident, noisome, puny, disparked*, and *antic*.

English History.

1. Which parts of France were under English control at the death of Henry the Fifth? Trace the steps by which they were lost.

2. What do you know of the Duke of Gloucester, the Earl of Suffolk, and the Duke of Somerset?

Geography.

1. Give an outline of the political condition of the states which acknowledge the Emperor of Austria as their chief.

2. What are the causes of the strength of Russia, and in which directions is the country weak?

3. Write a short description of the manufactures and the commerce of Germany.

Arithmetic.

1. After drawing 15 gallons from a cistern which was $\frac{4}{5}$ full, it is found to be $\frac{3}{5}$ full. What is the capacity of the cistern?

2. Find the value of $3\frac{1}{2}$ of $5\frac{1}{4}$ of 6 yds. 2 ft. + $\frac{4}{5}$ of $(6\frac{1}{4} - 1\frac{1}{2})$ of 4 poles 3 yds. 1 ft. – $\frac{5\frac{1}{2}}{\frac{3}{4}}$ of 6 poles 4 yds., and reduce the result to the fraction of 4 fur. $86\frac{1}{2}$ yds.

3. Reduce 11s. $4\frac{1}{4}$d. to the fraction of 18s. 7d., and divide the result by $\frac{1}{10}$.

Algebra.

1. Use the remainder theorem to ascertain whether $a + b$ is a factor of $a^3 + b^3 + c^3 + 3(b + c)(c + a)(a + b)$.

2. Test whether $a + x$ is a factor of $(a + x)^3 + (b - x)^3 - (a - b)^3$.

3. Find the factors of $a^5 + 6a^4 + 10a^3 - 11a - 6$.

Euclid.

1. If two circles touch one another externally in any point, the straight line which joins their centres shall pass through the point of contact.

If two circles do not meet, find the shortest distance between their circumferences.

2. If the distance between the centres of two circles is equal to the difference between their radii, the circles must touch one another.

Elementary Science.

1. Mention experiments you have seen which illustrate the indestructibility of matter.

2. What is the composition of the atmosphere, and how may it be proved?

NOTES AND SYLLABUS FOR NOVEMBER.

English Composition.

Study Nesfield's *Senior English Composition*, chap. vi., or Meiklejohn's *Art of Writing English*, chaps. vi., vii., and viii.

Prepare and write essays on the following subjects :—

1. The character of the Duke of Wellington.
2. England's interest in the Mediterranean.
3. The rights and duties of neutrals in time of war.
4. The study of English literature.

Theory of Teaching.

Study Collar and Crook's *School Management*, chap. ix., first part—that is, to the end of teaching of English grammar. The reasons for including this subject in the elementary school curriculum should be carefully studied, and the uselessness of treating the subject in a dogmatic and unreasoning way should be remarked.

English Language and Literature.

Read through the first series of the *Golden Treasury of Songs and Lyrics*, and commit a few complete specimens to memory, and enter phrases and passages in a notebook kept for that purpose. Add a few comments as to why they appeal to you as striking or beautiful, and afterwards commit these passages to memory.

Read through Scott's *Kenilworth*, not as though it were an examination task, but to get as much enjoyment from it as you can. Then read it through again, and try to remember the plot and the relations between the different characters.

Study in detail the fourth act of *Richard the Second*. This act opens with the question of the death of the Duke of Gloucester, and the student will remember that in the very first scene of the first act Bolingbroke makes a charge against Mowbray, Duke of Norfolk—

> "That he did plot the Duke of Gloucester's death,
> Suggest his soon-believing adversaries,
> And consequently, like a traitor coward,
> Sluiced out his innocent soul through streams of blood."

Now Bagot, a servant or favourite of Richard, accuses Aumerle of taking the chief part in the deed. His charge is supported by many nobles present, and Bolingbroke is finally obliged to intervene to prevent the quarrel from assuming too large proportions. It should be remembered that in 1386, when the storm of popular indignation burst out on account of Richard's misgovernment, the king's uncle, the Duke of Gloucester, placed himself at the head of the parliamentary party against the crown. When the Chancellor, Lord Suffolk, was impeached, Gloucester warned the king of the danger of refusing the popular demands and of trying to screen the Chancellor, and Gloucester became chief of the body of commissioners appointed to reform abuses. The commission was appointed for one year only, but before the expiration of that period open civil war had broken out between the king and the people. Gloucester gained the mastery in this conflict, and for more than a year was the real master of England; but in May 1389, by a sudden display of resolution, Richard recovered the power. The Duke of Lancaster, with seeming success, endeavoured to effect a reconciliation between the king and Gloucester, and his son Bolingbroke went over to the king's side. After a period of peace the king again attacked his old enemies. By the exercise of treachery, Richard secured the arrest of the Earls of Warwick and Arundel, and of the Duke of Gloucester. By Richard's orders the latter was taken to Calais, where he was soon afterwards murdered. After his death judicial proceedings were taken, so that the king might secure his dead uncle's wealth.

The description of the fate of Norfolk, as given by the Bishop of Carlisle, is well worth committing to memory on account of its beauty.

Then the Duke of York enters and announces the abdication of Richard in favour of Bolingbroke, who at once says,—

> "In God's name, I'll ascend the regal throne."

In this resolution he is opposed by the Bishop of Carlisle, whom history has handed down to us as the only one present who ventured to deny the right to depose the king. He prophesied as a consequence the outbreak of the civil wars, and was arrested by Northumberland. In this scene of the deposition of Richard he begins to gain our pity on account of the indignities heaped

upon him, and the exaggerated sensitiveness with which he receives them. As we have said, this scene was omitted from the play when acted during the reign of Elizabeth. As soon as the other characters leave the stage the treacherous Aumerle begins to weave a plot against Henry.

Scene i., line 21. *My fair stars*—that is, the stars under which I was born. When astrology was commonly believed in, the rich and great were supposed to be born under the fairest and brightest stars.

24. *Attainder* = accusation, or charge.

31. *Excepting one.* Aumerle means that if Bagot held any position in the ranks of the nobility except that of the king its head.

52. *Task the earth*—that is, burden it. This is a bombastic way of saying that he throws down his gage.

78. *That lie do lie.* Notice the pun.

98. This dramatic account of the death of Norfolk is one of the historical inaccuracies of the play. Norfolk did not die till after King Richard's death.

115. May I, the worst, or humblest, in this royal presence speak.

119. *Noblesse* = nobility or nobleness.

120. *Learn.* Notice the use of *learn* in the same sense as *teach*. It is a common mistake with children to confound these two words, but formerly they were synonymous. "Them that are meek shall he guide in judgment, and such as are gentle them shall he *learn* his way."—*Psalm.*

124. *Apparent* = evident, unmistakable.

151. *Capital treason*, treason that merits the *capital* penalty, or sentence of death. Lat. *caput*, the head.

160. *Beholding* = beholden. Compare "The stage is more *beholding* to love than the life of man."—Bacon.

185. *Owes* = owns.

212. *Revénues.* Notice the accentuation. It now takes the accent on the first syllable.

238. *Bait.* This is from the same root as *bite*, and Richard means that his wretchedness is attacking him and biting him like a dog.

250. *Pompous body*, a body surrounded by pomp and ceremony.

254. *Haught* = proud. The French word *haut*, "high," also means proud, although "proud" is generally translated by *hautain*.

295–7. Compare—

"But I have that within that passeth show—
These but the trappings and the suits of woe."—*Hamlet.*

317. *Convey?—conveyers.* The word convey in former times had also the meaning "to steal." Pistol says of stealing, "'Convey,' the wise it call," *Merry Wives*, I. iii. 32; and again in *I. Henry VI.*, I. iii. 2.

"Since Henry's death, I fear, there is conveyance."

English History.

Study to the end of the Tudor Period, 1603. In preparing this period it is very important to study the great movements that were taking place abroad. Note particularly the Renaissance, which had its centre in Italy. Art flourished particularly in Florence, but Venice, Milan, Rome, and the other great towns were also prominent in the movement. Foremost among the artists were Leonardo da Vinci, Michael Angelo, Raphael, and Andrea del Sarto. In Northern Europe the two Flemish brothers Van Eyck invented the art of painting in oil colours, Holbein produced his masterpieces, and Albrecht Dürer brought the art of engraving to a high state of perfection.

The invention of printing did much towards the spread of knowledge. The early history of printing should be read up. But among the discoveries that have had a permanent effect in history we must give a very prominent place to those which extended our knowledge of geography. The ancients knew very little about the world except those parts that bordered on the Mediterranean Sea. In 1275 Marco Polo, a Venetian merchant, started on a journey to the Far East which lasted twenty years. His account filled Europe with wonder, especially his fabulous description of the golden island of Zipangu (Japan) and of the spice markets of Ceylon and the Moluccas. Early in the fourteenth century Venice and Genoa began to trade with the Netherlands by sea. Their ships used to call at Lisbon, and the Portuguese were stirred up to maritime enterprise. About the middle of the fourteenth century they had discovered the Canary Islands, the Azores, and Madeira; and in 1445, after passing hundreds of miles of barren, deserted coast, some of their sailors reached a region of rich tropical vegetation which they called Cape Verde. This led them to press on and endeavour to come to the southern extremity of the land and reach India. The Cape of Good Hope was rounded in 1486 by Diaz, and in 1498 Vasco da Gama followed the coast up northward past Zanzibar, and then struck across the Indian Ocean and reached Calicut in India. This brought the Portuguese into competition with the Italian merchants in the spice trade, which was extremely important in those days, because spices were in great demand for the preservation of food, which took a long time to travel from place to place, and cold storage was unknown.

The desire to reach these spice islands by sailing westward led Columbus to discover America.

Soon after this, Magellan succeeded in circumnavigating the world. English explorers paid their attention to the coasts of North America, in the hope of finding a passage to the spice islands in that direction. The Spaniards explored South America. Cortez conquered for them the empire of Mexico, and Pizarro subjugated Peru. These valuable possessions led to the maritime supremacy of Spain. A very far-reaching discovery made at this time was that of Kopernik, or Copernicus, a Polish astronomer, who came to the conclusion that the earth is not the centre of the universe, but, in common with the other planets, revolves round the sun.

Among the miscellaneous discoveries made in the fourteenth and fifteenth centuries are the mariner's compass, gunpowder, spectacles, and the art of casting iron.

In the reign of Henry the Eighth we first come upon the celebrated political doctrine of the "balance of power." The originator of the idea was Cardinal Wolsey, who held that universal peace and the interest of all states required that the power of a state should balance that of its neighbours, and that no one state should be allowed to become dangerous by unduly extending its power. This theory was the guiding principle of European statesmen for centuries, and we shall have to refer to it frequently when discussing European politics later on. It was this theory that made Wolsey side with the Emperor Charles the Fifth when Francis the First of France was successful; but when the latter was defeated at Pavia, Wolsey took his part.

The history of the Reformation forms an important topic in this period; and it should be noticed that the Roman Catholic Church found it necessary to draw up and define an exact statement of its own position, and to reform for itself many abuses that had crept in. This was done at the Council of Trent. Various orders endeavoured to further the interests of the Church, but the one that became most important politically was the order of the Jesuits, founded by Ignatius Loyola, a Spaniard, in 1538.

Geography.

Study the geography of Asia. Points which are of special interest at the present day are the rise and progress of the Empire of Japan and the partial decadence of China. The way in which China has been obliged to cede parts of her territory under "leases" and other agreements requires careful attention. An account of the country of Thibet should be prepared, and the questions from which have arisen the Russo-Japanese War and the British expedition to Thibet should be mastered.

Arithmetic.

Prepare the theory of decimals, paying especial attention to recurring decimals.

The following questions were set at the Certificate Examination in July last:—

1. *Explain as you would to an upper class how the length known as a kilometre is obtained in theory, and how a litre and a gramme are derived from it.* [See Christian and Collar's *Arithmetic*, chap. xxiv.]

A train travels 400 miles at the rate of 48 kilometres an hour. How long will the journey take, and what will it cost in francs at ¾d. a kilometre? Assume that £1 = 25 francs, and that 1 metre = 3 ft. 3⅜ in.

48 kilometres = 48000 times $39\cdot\dot{3}$ inches = 1888000 in.

$\therefore$ the train takes $\frac{400 \times 1760 \times 36}{1888000}$ hours = $13\frac{23}{59}$ hours.

An hour's ride (48 kilometres) costs ¾d. × 48 = 36d.

$\therefore$ the total journey costs $\frac{792 \times 36}{59}$d. = $\frac{792 \times 3}{59}$s. = £$\frac{792 \times 3}{59 \times 20}$

$= \frac{792 \times 3 \times 25}{59 \times 20}$ francs = 50 fr. 34 centimes.

2. *Work clearly by the shortest method the following:—*

(*a*) $\frac{1}{10000} + \frac{47}{100} + \frac{185}{1000} - \frac{5}{10}$.

These quantities are decimal fractions written in the form of vulgar fractions. The question really is:—

$$\cdot0001 + \cdot47 + \cdot185 - \cdot5.$$

Considering the first place of decimals, it is evident that $\cdot4 + \cdot1 - \cdot5 = 0$. Hence all the working necessary is

$$\cdot0001 + \cdot07 + \cdot085 = \cdot1551. \quad \text{Ans.}$$

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CERTIFICATE, JULY, 1904.

The following

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(*e*) 11·2112 lbs. + 2·8999 cwts.

The digits 112 stare one in the face and remind the student that 112 lbs. = 1 cwt. ∴ 11·2 lbs. = ·1 cwt., and ·0112 lbs. = ·0001 cwt. Hence 11·2112 lbs. = ·1001 cwt. Adding this to 2·8999 cwts., the result is 3 cwts.

(*f*) *Square root of* $(7{\cdot}163)^2 + 2 \times 7{\cdot}163 + 1$.

This is evident to all who remember the simple algebraical formula $(a + b)^2 = a^2 + 2ab + b^2$.

Hence $\sqrt{(7{\cdot}163)^2 + 2 \times 7{\cdot}163 + 1} = 7{\cdot}163 + 1 = 8{\cdot}163$.

(*g*) *Divide* $(3{\cdot}1415)^2 + 4 \times (3{\cdot}1415) + 3$ *by* 4·1415.

The occurrence of ·1415 in three of the four terms suggests that 4·1415 should be treated as 3·1415 + 1. Then employing the ordinary methods of algebraical division we obtain—

$$3{\cdot}1415 + 1\,)\overline{(3{\cdot}1415)^2 + 4 \times (3{\cdot}1415) + 3}\,(3{\cdot}1415 + 3$$
$$\underline{(3{\cdot}1415)^2 + 1 \times (3{\cdot}1415)}$$
$$3 \times (3{\cdot}1415) + 3$$
$$\underline{3 \times (3{\cdot}1415) + 3}$$

Ans. 6·1415.

(*h*) *Simplify*— $\left(\frac{315}{124} + \frac{62}{315}\right)^2 - \left(\frac{315}{124} - \frac{62}{315}\right)^2$.

This is a very simple application of the formula

$$a^2 - b^2 = (a + b)(a - b).$$

Hence the expression factorises into—

$$\left(\frac{315}{124} + \frac{62}{315} + \frac{315}{124} - \frac{62}{315}\right)\left(\frac{315}{124} + \frac{62}{315} - \frac{315}{124} + \frac{62}{315}\right)$$
$$= \frac{315}{62} \times \frac{124}{315} = 2.$$

3. *From a piece of silk* 23·4 *yds. in length I cut off as many pieces* ·07 *yds. long as possible. How many pieces do I cut off, and what is the length of the remnant?*

(*If you can, work this by short division, and be careful to explain the position of the decimal points.*)

This example will prove a stumbling-block to all who can merely work division of decimals mechanically, and illustrates the vast superiority of the method given in par. 153.

$$23{\cdot}4 \div {\cdot}07 = 23{\cdot}4 \div ({\cdot}01 \times 7).$$

Dividing by factors, we obtain—

·01 | 23·4

7 | 2340

334 rem. 2.

According to the rule for finding the true remainder when dividing by factors we must multiply 2 by ·01, and obtain ·02.

Hence the answer is 334 pieces and ·02 yards over. This is shown to be correct by proving by multiplication.

$$334 \times {\cdot}07 + {\cdot}02 = 23{\cdot}38 + {\cdot}02 = 23{\cdot}4.$$

Algebra.

Prepare the chapters on L.C.M. and on operations with fractions. The value of your knowledge of factors will come in here, but there are no new principles involved with which you should not be thoroughly familiar in arithmetic. The first thing to do in every example is to factorise each expression contained in it.

Geometry.

Finish the propositions in the third book. A difficulty is sometimes felt over xvii., when the given point is without the circle. This will be overcome by considering the proposition from the reverse position—namely, by analysing it or beginning by supposing the tangent already drawn.

Let AB be the required tangent. Join A to the centre C, cutting the circumference in D. Draw DE at right angles to AC, meeting CB produced in E. Then by I. 26 the triangles ABC and CDE are equal in all respects; and as AC = CE, it follows that A and E are on the circumference of the same circle, whose centre is C. Hence, in the construction, after joining the given point with the centre of the given circle, we describe a larger circle with the same centre and passing through the given point.

In Prop. 20 it is usual to make two cases—(*a*) when the centre of the circle is within the angle at the circumference, (*b*) when it is without it. But this is quite unnecessary. The only point of difference between the two cases is that in the first we add two pairs of equal angles together, and in the second we subtract them; and it will be seen that by using the phrase "the sum or difference," as in I. 35, the two cases may be made into one. Of course, two figures should be drawn.

The student will greatly simplify his work in the third book if he notes which propositions are the converse of others, and also if he sets himself, among the first deductions he attempts, to prove the converse of those propositions of which the converse is true. In some cases, as in Propositions 14 and 15, the converse forms part of the same enunciation.

Prop. 18 is the converse of 16.
Prop. 19 is the converse of 16 and of 18.
Prop. 27 is the converse of 26.
Prop. 29 is the converse of 28.

The converse of 21 is very important, and may be thus stated:—If on the same base and on the same side of it there be two triangles whose vertical angles are equal, the circle passing through the three angular points of one triangle will pass through the vertex of the other. Like most converse propositions, this is proved negatively.

The converse of 22 may be thus enunciated:—If two opposite angles of a quadrilateral are together equal to two right angles, a circle drawn through any three of the angular points will pass through the other—that is, the four points are *concyclic*. Note that if one pair of opposite angles of a quadrilateral be together equal to two right angles, the other pair must also be equal to two right angles (I. 32, cor. 1); and remember this convenient word "concyclic," which means falling on the circumference of the same circle.

In the enunciations to Props. 26–29 there is a similar difficulty to that which is met with in the eighteenth and nineteenth propositions of the first book—namely, the difficulty of remembering which is hypothesis and which is sequence. This is obviated by paraphrasing them thus:—

26. In equal circles, if two angles be equal to one another, whether both be at the centre or both at the circumference, the arcs on which they stand are equal to one another.

27. In equal circles, if two arcs be equal to one another, the angles at the centre which stand on them are equal, and likewise those at the circumference.

28. In equal circles, if equal chords be taken, the arcs which they cut off are respectively equal.

29. In equal circles, if two arcs are equal, the chords which subtend them are also equal.

In many editions of Euclid there is a definition of the angle of a segment—namely, the angle between the arc and its chord. This is the only reference to a curvilineal angle, although the fact that in the first book the definition of a *plane rectilineal angle* is preceded by the definition of a *plane angle* suggests that there are other plane angles besides rectilineal ones. The student may wonder how the inclination of a curved line can be estimated, seeing that it varies throughout its entire length, but we confine our attention to the inclination of a curve *at a point*, and this is the same as that of the tangent to the curve at the point. Bearing this in mind, we see that the angle of a segment and the angle in the segment are supplementary—that is, their sum is equal to two right angles.

Elementary Science.

Begin Section B, and study carefully those characters by which organic matter is distinguished from inorganic, and also those by which animals differ from plants. It will easily be seen that some substances have life, or are intimately associated with life, while other substances have an existence quite independent of it. In most living things different parts are specially fitted for carrying on special work. These parts are called "organs," and a body which is provided with organs is said to be "organised." Many substances, such as fat, sugar, and starch, are generally found to be produced as the result of life in an organised being, hence they are called "organic" substances; while other substances, such as flint and iron, are called inorganic substances. In 1828 it was proved, however, that a substance called urea, which is secreted by the kidneys of animals, could be built up artificially by chemical means in the laboratory, and since that date many substances have been formed artificially which were formerly obtained only from animals and plants. But though the old distinction between organic and inorganic substances has been broken down, the term "organic" is applied in chemistry to those compounds of carbon which are allied to the old organic bodies. Some of the compounds of carbon are inorganic bodies—for example, carbon dioxide. This gas can be produced by burning carbon in the air or in oxygen. It is found, however, that the green parts of plants under the influence of sunlight are able to absorb this inorganic gas, and make it combine with the inorganic substance water, and build up the organic body starch. From this other organic bodies, such as sugar, gum, and cellulose, are formed. These are all much more complex in composition than the substances from which they are formed. But these substances form the food of animals, either directly in the case of herb-eating animals, or indirectly in the case of beasts of prey, and then they are decomposed into much simpler bodies, and, finally, for the most part, given off in the form of water and carbon dioxide. Thus animal life reverses the processes accomplished by vegetable life.

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CHEMISTRY.

(ADVANCED AND HONOURS.)

BY C. A. WEST, B.SC., A.R.C.S., F.I.C.

Radio-activity of Minerals.—The following is an easy and simple method of testing minerals for radio-activity. Cut a small regularly-shaped aperture, such as a triangle, in a sheet of metal, and place the mineral above the hole in the metal plate, and a sensitive plate below it. Allow them to remain in this position in the dark for from one to twenty-four hours, then develop the image. The images thus obtained can be compared. From experiments carried out in this way, it appears that most of the radio-active minerals tested, except the coloured fluorspars and a few minerals containing organic matter, contain oxide of thorium or of uranium, or both. Some minerals, however, appear to possess a greater amount of radio-activity than can be accounted for by the amount of these substances which they contain.

Pyro-radio-activity.—The numerous investigations which are now being prosecuted on the subject of radio-activity are constantly bringing new and intensely interesting facts to light, and are completely revolutionising many of our preconceived ideas. Thomas Tommasina has recently published (*Arch. Sci. Phys. Nat.*) the results of his experiments on pyro-radio-activity. By pyro-radio-activity we mean that radio-activity which is produced by the agency of heat. When metals are heated by means of electric currents they become radio-active, and capable of discharging an electroscope. The various metals, however, do not seem to be affected in quite the same way; for instance, iron, copper, and platinum are able to discharge a negatively charged electroscope in a much shorter time than a positively charged one, while the reverse is true in the case of silver and zinc. If the current, and therefore the temperature, is increased, the difference in the effects of any metal on negatively and positively charged electroscopes tends to disappear, and at a bright incandescence the metal discharges either with about equal readiness.

The radio-activity of a metallic thread, kept at a red heat by a current, diminishes along an asymptotic curve. Its power, however, is regained if it is allowed to rest for some time, or if it is subjected to slight friction. When a wire has been heated for some time, and the radio-activity has become weak, the radio-activity remains for some time after the current is switched off. It is lost, however, if the wire is struck. A glass or aluminium mantle placed round the wire becomes radio-active. Three distinct types of emanations are recognisable—the α, easily stopped by screens; the β, more penetrative; and the γ, which discharge either a positively or negatively charged electroscope, induce fluorescence, etc. These rays, however, are much less penetrative than the rays given out by radium.

Hydrides of Phosphorus, Sulphur, and the Halogens as Conducting Solvents.—Douglas M'Intosh and Bertram D. Steele, in the *Proceedings of the Royal Society*, 1904, p. 73, give an account of their experiments, in which they used the liquefied hydrides of phosphorus, sulphur, and the halogens as solvents for electrical conductivity experiments. Their paper is especially interesting, as it contains particulars of the boiling-points and melting-points, etc. The following is an abstract:—As a preliminary to the main investigation, a number of physical constants of the above-mentioned solvents have been measured. The vapour pressure curves have been determined by the method of Travers, Senter, and Jaquerod, and from these curves the following melting- and boiling-points have been read. Hydrogen chloride, b.p. – 82·9°; hydrogen bromide, m.p. – 86°, b.p. – 68·7°; hydrogen iodide, m.p. – 50·8°, b.p. – 35·7°; hydrogen sulphide, b.p. – 60·1°; hydrogen phosphide, b.p. – 86·2°. The densities of the liquids were determined over a wide temperature range, and the values at the boiling-point for hydrogen chloride, bromide, iodide, sulphide, and phosphide are respectively 1·195, 2·157, 2·799, 0·964, 0·744. A study of the molecular surface energy shows that of the substances examined, the bromide, iodide, and sulphide occur as simple molecules whilst the chloride and phosphide are more or less associated. The viscosities also have been measured, and the following temperature-coefficients of viscosity have been obtained. Hydrogen chloride, 0·88; hydrogen bromide, 0·57; hydrogen iodide, 0·70; hydrogen sulphide, 1·10. In the preliminary investigation, the organic ammonium salts were found to dissolve readily to conducting solutions, the conductivity of which increased enormously with increasing concentration, in sharp contrast to the behaviour of aqueous solutions. No metallic salts appeared to dissolve; at any rate, none were found to conduct the current. Hydrogen chloride and bromide dissolve readily in liquid hydrogen sulphide, but give non-conducting solutions.

In hydrogen chloride, bromide, iodide, and sulphide, many organic substances are readily soluble, such as amine salts, acid amides, certain alkaloids, alcohols, ethers, ketones, phenols, and some organic acids and esters. In every case where a conducting solution is formed, the dissolved substance contains an element (nitrogen or oxygen), the valency of which may be increased. In every one of the large number of solutions examined, the molecular conductivity was found to increase enormously with increasing concentration. The solutions rarely conduct better than N/25KCl. Many temperature-coefficients have been determined, and these are found to be positive in the majority of cases. All the experiments go to indicate that the current is carried by the dissolved organic substance, not by the hydride.

Catalytic Action of Metallic Chlorides.—The influence of stannic chloride and aluminium chloride on the rate of chlorination of nitrobenzene has been studied quantitatively. Solutions of chlorine in nitrobenzene and of the metallic chloride in nitrobenzene have been studied quantitatively. Solutions of chlorine in nitrobenzene were mixed and kept in a bath at a suitable temperature, the amount of free chlorine being determined from time to time by adding a known quantity of the mixture to excess of potassium iodide solution. For a given quantity of catalytic agent, the course of the chlorination is that of a unimolecular reaction. The rate of change is proportional to the concentration C of the catalytic agent, and is therefore expressed by the equation $dx/dt = K.C(a - x)$. At 50°, K, for stannic chloride, = 0·000778, for aluminium chloride K = 0·0239, so that the chlorination of nitrobenzene takes place thirty-one times more rapidly in the presence of aluminium chloride than in that of stannic chloride. Over the temperature range 50° to 100°, the velocity constant at T + 10 is 1·35 times that at T. Comparative experiments show that ferric chloride is still more effective than aluminium chloride. Antimony and phosphorus pentachlorides and arsenic trichloride exert practically no catalytic action.

Friedel and Craft's reaction also has been studied quantitatively, and in particular the interaction of benzyl chloride, anisole, and aluminium chloride. The course of the reaction was followed by extracting the unchanged benzyl chloride, hydrolysing with alcoholic soda, and titrating with silver nitrate. Experiments at 25°, 15·2°, and 0° show that the reaction between anisole and benzyl chloride is of the first order, and that the rate of change is proportional to the concentration of the aluminium chloride. For a rise of 10°, the velocity coefficient is nearly doubled.

Black Coating Resisting Acids and Alkalis.—The following method of protecting laboratory benches is given in the *Ann. Chim. Anal.*, by Ferdinand Jean. The benches, etc., are treated three times in succession with (1) solution of 150 grams

BOOKS TO NOTE.

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of aniline hydrochloride per litre, (2) a solution containing 86 grams of cupric chloride, 77 grams of potassium chlorate, and 33 grams of ammonium chloride per litre. After eight days, a coating of linseed oil is put on.

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Behaviour of Telluric Acid during Electrolysis. A New Modification of Colloidal Tellurium.—When an aqueous solution of telluric acid containing potassium cyanide is electrolysed with a current of 0·5 ampere, the solution gradually becomes brownish-violet, owing to the formation of tellurium in the hydrosol form. As the electrolysis is continued, the tellurium separates as a flocculent precipitate. When ammonium oxalate is substituted for potassium cyanide, the steel-blue hydrosol of tellurium is first of all formed. By dialysis, the new brownish-violet hydrosol form may be obtained in brilliantly-coloured solutions, which are not decomposed after six months.

PHYSIOGRAPHY.

(STAGES 2 AND 3.)

BAROMETRIC CORRECTIONS.

THE invention of the barometer is due to Torricelli, who first used the simple form of barometer, and showed that the air has weight, and also measured the pressure exerted by it. Let us then consider the Torricellian experiment. Take a rather thick-walled glass tube, about eighty-five centimetres long and one centimetre bore, and closed at one end. Fill this entirely with mercury in the following way. Support the tube open end upwards in a suitable stand. Now take a narrow-bore tube (about three millimetre bore will serve very well), about ninety centimetres long, and to one end of this attach a small funnel by means of rubber tubing. Draw the other end out to a fine tube of about one millimetre bore, and pass this down the interior of the wider tube to the bottom. Now pour mercury into the tubes through the funnel until the outer tube is filled. Then gradually withdraw the narrow tube, filling in more mercury to replace the glass tube.

The advantage of filling a tube with mercury by this method is, that as the mercury flows into the wider tube it flows in gently, and drives out the air before it. If the mercury is poured in without the inner tube it will be found that numerous bubbles of air, having the appearance of water globules, remain in many places between the mercury and the glass, and these are difficult to expel. If, on the other hand, the tube is filled slowly in the way described, very few, if any, air bubbles will be seen. Now see that the tube is completely filled and the mercury is standing above the mouth of the tube. Firmly place the thumb over the end and invert the tube, placing its mouth beneath the surface of mercury in a dish before removing the thumb. On removing the thumb, and placing the tube in a vertical position, it will be seen that the mercury falls in the tube, until the difference in the levels of the surfaces of the mercury in the tube and in the dish is about seventy-six centimetres, an empty space being apparently left in the tube above the mercury. This space, however, is not empty, but contains a small quantity of mercury vapour, together with a small quantity of air. This space, however, is often spoken of as the Torricellian vacuum. It is very difficult to get the space absolutely free from air, and barometer manufacturers have their own methods of attaining this end as nearly as possible, and these methods they guard as trade secrets.

One method of getting rid of most of the air is to boil the mercury in the tube; but this should never be attempted without special appliances, as there is danger of breaking the tube, and the mercury fumes are very poisonous.

We can easily test whether the vacuum we have obtained is a good one or not by placing the tube in a sloping position, so that the top of the tube is somewhat less than seventy-six centimetres above the level of the mercury in the dish in which the other end of the tube is immersed. If an air bubble now appears at the top of the tube the vacuum is not good. If the vacuum is good, place the tube again in a vertical position. We can now use it as a barometer.

Let us consider the pressure which keeps the level of the mercury so high in the tube. We know that the pressure at a point in a liquid is the same as the pressure at any other point at the same level in the same liquid, and therefore we know that the pressure on the outside surface of the mercury in the dish is equal to the pressure at the same level inside the tube. Now, the pressure on the outside surface of the mercury in the dish is the pressure exerted by the atmosphere, and the corresponding pressure inside is the pressure due to the column of mercury, plus the pressure due to the mercury vapour. The pressure due to the mercury vapour at ordinary temperatures is so very small that for most practical purposes it may be disregarded. We shall consider, then, that the pressure is due to the column of mercury only. The old explanation which used to be given of the fact that the mercury remained in the tube was that "Nature abhorred a vacuum."

Pascal, however, by repeating the Torricellian experiment at various heights above the sea-level, showed that the height of the column varied with the elevation. He thus disproved the old explanation, and proved conclusively that the column was supported by the atmospheric pressure outside.

The pressure per square centimetre, or the intensity of the pressure exerted by the column, depends upon the density of the mercury, upon the gravitational force acting on it, and upon the height of the column. It is, in fact, equal to the product of these three quantities, and we may express this in the form of an equation thus—$P = hdg$.

Where P is the pressure in dynes, h is the height of the column in centimetres, d is the density of the mercury or the mass in grams per cubic centimetre, and g is the force in dynes exerted by the earth on the mass of one gram.

We shall now see how the readings of the barometer are affected by changes in some of these quantities and by other causes, and how the necessary corrections are to be made. For some purposes it is desirable to keep records of the fluctuations in the heights of barometers in various parts of the world; but before the readings can be advantageously compared, it is necessary to reduce all the readings to a common standard. The readings are all reduced to what they would be if the barometer were at the sea-level and the temperature zero on the centigrade scale. The pressures are usually expressed in centimetres of mercury; but if absolute pressures are required, the variations in the force of gravity must be taken into account.

The following are the chief corrections:—

(*a*) **Corrections for Temperature.**—From the above equation it will be seen that anything which affects the density of the mercury will affect the pressure exerted by a column of mercury of definite length, and, therefore, for a given pressure and fixed value of g, if the density of the mercury changes, the height of the barometric column must change accordingly. Now, a change in temperature causes the mercury to become more or less dense, according as the temperature falls or rises. We usually correct the recorded height of the barometer to the height of a column of mercury at 0° C., which would give the same pressure. This is an easy matter in practice, for Regnault determined and tabulated the densities of mercury over a considerable range of temperatures. For the purpose of making this correction, a thermometer is usually mounted on the stand supporting the barometer.

The length of the column of mercury is usually read off on a scale placed behind the barometer tube or engraved on the tube itself. The length of this scale, of course, also varies with the temperature, and if very accurate results are required, a correction must also be applied for this, so as to get the real length of the mercury column.

(*b*) **Correction for Altitude.**—If we carry a barometer up a mountain, the height of the mercury column gradually diminishes; and if we find, say, that in carrying a barometer from the sea-level to a certain place above this level the height of the column falls on the average, say, through ten centimetres, we must add ten centimetres to all readings taken at this station.

(*c*) **Correction for Capillarity.**—When an open narrow-bore tube is dipped into water, the water rises in the tube; but when such a tube is dipped into mercury, we find that the surface of the latter is depressed, owing to the surface tension of the mercury. The same holds in the case of the mercury in the barometer tube, and the surface is lower than it would be if it were not for this. If the barometer tube is narrow, the error due to this cause is appreciable, and a correction must be applied. The error is different according as to whether the mercury is falling or rising. The correction to be applied depends upon the bore

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of the tube, and with bores above three centimetres it becomes inappreciable.

(*d*) **Correction for g.**—If the barometric readings taken at different places are required for accurate comparisons, then it is advisable to express the pressures in absolute measure. In Paris the value of g is 980·94. This means that in Paris the force of attraction exerted by the earth on the mass of one gram is 980·94 dynes. The value of g at Greenwich is 981·17. Let us return to our equation $P = hdg$. Having obtained the height of the barometer, corrected for capillarity, temperature, and altitude, the product of h and d is known. If we now multiply this by the value of g at the place, we get the pressure in dynes per square centimetre. The density of mercury at 0° C. is 13·596, and hence when the barometer in London stands at 76 centimetres (corrected), the pressure will be

$$76 \times 13{\cdot}596 \times 981{\cdot}17 = 1{\cdot}0138 \times 10^6 \text{ dynes.}$$

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Velocity, Time, and Distance.—If a body is moving in such a manner that f feet per second are added to its velocity each second, then in t seconds the increase in its velocity will be ft. If u is the velocity at the beginning, and v the velocity at the end of the time t, then

$$v = u + ft. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Similarly, if f feet per second are subtracted, or, in other words, if retardation instead of acceleration takes place, then

$$v = u - ft.$$

The two cases are usually included by using the double sign.

$$\therefore v = u \pm ft.$$

With constant or uniform acceleration the average velocity is

$$\tfrac{1}{2}(u + u + ft) = u + \tfrac{1}{2}ft.$$

Space described = (average velocity) (time).

$$\therefore s = (u + \tfrac{1}{2}ft)t = ut + \tfrac{1}{2}ft^2. \quad . \quad . \quad . \quad . \quad . \quad (2)$$

From (1) $t = \dfrac{v - u}{f}$. Substitute this value for t in (2).

$$\therefore v^2 - u^2 = 2fs. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Multiplying both sides of (1) by m, we find

$$m(v - u) = mf \times t = Ft,$$

or *change of momentum is equal to the product of a force and the time during which it acts.*

Similarly, multiplying both sides of Eq. (3) by m, we obtain

$$\tfrac{1}{2}m(v^2 - u^2) = mf \times s = Fs,$$

or the *change in the kinetic energy* is equal to the *product of the force and the space through which it acts.*

The preceding equations may be obtained in a more direct manner by using the simple notions of the calculus.

Thus, retaining the same letters, we write $\dfrac{d^2s}{dt^2} = f$, and integrating this, $\dfrac{ds}{dt} = v = ft + C$, where C is a constant of integration. To obtain the value of the constant it is only necessary to ascertain the value of v when $t = 0$. Let this be u, then

$$\frac{ds}{dt} = v = u + ft.$$

Again integrating, $s = ut + \tfrac{1}{2}ft^2 + C$, and if $s = 0$ when $t = 0$, then $C = 0$. $\therefore s = ut + \tfrac{1}{2}ft^2$.

If f has the value g, where g is the acceleration due to gravity, then it is only necessary to write g for f in the preceding equations, and obtain the so-called laws of falling bodies—that is,

$$v = u \pm gt,\ s = ut \pm \tfrac{1}{2}gt^2,\ v^2 - u^2 = 2gs.$$

If the body start from rest, or the initial velocity is zero, then these equations become—

$$v = gt,\ s = \tfrac{1}{2}gt^2,\ v^2 = 2gs.$$

Ex. 1. Establish the formulæ of uniformly accelerated motion. A falling body is observed to pass over the final 100 feet of its descent in two seconds. Find the final velocity and the height of the point from which the body commenced to fall, neglecting the resistance of the air. (B.A., 1900.)

Let H + 100 denote the height of the point from which the body commenced to fall. Then, if t is the time required to fall through H feet, we have—

$$H = \tfrac{1}{2}gt^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$\text{Also } H + 100 = \tfrac{1}{2}g(t + 2)^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Subtracting (1) from (2), we obtain—

$$50 = gt + g.$$

$$\therefore t = \frac{50 - g}{g} = \frac{18}{32} = \cdot 5626 \text{ seconds.}$$

$$\text{Hence } H + 100 = 16 \times (2{\cdot}5626)^2 = 105{\cdot}1 \text{ feet.}$$

If v denotes the final velocity, then from $v = gt$ we obtain—

$$v = 32 \times 2{\cdot}5626 = 82 \text{ feet per second.}$$

Ex. 2. Write down the formulæ required in rectilinear motion with constant acceleration, and prove that if a body starts from rest, acquires a maximum velocity V with constant acceleration, and then comes to rest again with constant retardation, all in a distance s, the time occupied is $s/\tfrac{1}{2}V$. (B.A., 1901.)

If f denotes the constant acceleration, and t the time taken to describe a distance $\dfrac{s}{2}$, then $\dfrac{s}{2} = \tfrac{1}{2}ft^2 = \tfrac{1}{2}Vt$. $\therefore t = \dfrac{s}{V}$.

As the time taken during retardation is the same, the total time occupied will be $\dfrac{2s}{V}$, or $\dfrac{s}{\frac{1}{2}V}$.

Ex. 3. A body was observed to take t seconds in falling past a hatchway to the bottom of a hold h feet deep. Prove that it fell $\tfrac{1}{2}g\left(\dfrac{h}{gt} + \tfrac{1}{2}t^2\right)$ feet, and struck with velocity $\dfrac{h}{t} + \tfrac{1}{2}gt$ feet per second. (Inter. Science, 1903.)

Let H denote the total height (from the bottom of the hold) through which the body fell. Then the velocity V is given by $V = \sqrt{2g}H$. Also $v = \sqrt{2g(H - h)}$ . . . . . (1)

From the relation average velocity × time = space, we obtain—

$$\frac{V + v}{2} \times t = h \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Substituting from (1) in (2),

$$\frac{\sqrt{2g}}{2}\{\sqrt{H} + \sqrt{H - h}\}t = h,$$

$$\text{or, } \sqrt{H} + \sqrt{H - h} = \frac{h}{t}\sqrt{\frac{2}{g}}.$$

$$\therefore \sqrt{H} = \frac{h}{t}\sqrt{\frac{2}{g}} - \sqrt{H - h}.$$

Squaring both sides, we find—

$$H = \left(\frac{h}{t}\right)^2 \times \frac{2}{g} + H - h - 2\frac{h}{t}\sqrt{\frac{2}{g}}\sqrt{H - h},$$

$$\text{or, } \left\{\left(\frac{h}{t}\right)^2 \times \frac{2}{g} - h\right\}\frac{t\sqrt{g}}{2h\sqrt{2}} = \sqrt{H - h}.$$

$$\therefore \frac{g}{2}\left(\frac{h}{gt} - \frac{t}{2}\right)^2 = H - h.$$

$$H = \frac{g}{2}\left(\frac{h^2}{g^2t^2} + \frac{t}{4}\right)^2 - \frac{2ht}{2gt} + \frac{2h}{g}$$

$$= \frac{g}{2}\left(\frac{h}{gt} + \tfrac{1}{2}t\right)^2. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

From $V = \sqrt{2g}H$, substituting from (3), we find—

$$V = \sqrt{2g\left\{\frac{g}{2}\left(\frac{h}{gt} + \tfrac{1}{2}t\right)^2\right\}}$$

$$= g\left(\frac{h}{gt} + \tfrac{1}{2}t\right) = \frac{h}{t} + \tfrac{1}{2}gt.$$

A *Geometrical Political Economy*, by Mr. H. Cunynghame, C.B., is about to be published by the Oxford University Press. It is an elementary treatise on the method of explaining some of the theories of pure economic science by means of diagrams; and it does not require in the reader any knowledge of mathematics, except such geometry as has been acquired at school, and very little of that. The author admits that to a number of thinkers of great powers the very sight of a diagram is odious, but, he contends, the geometrical method is so charming when once it is grasped, and enables somewhat recondite laws to be so clearly seen, that its mastery is worth an effort.

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Ambitious.—If $\cos A + 2\cos C : \cos A + 2\cos B = \sin B : \sin C$, prove that the triangle ABC is either isosceles or right angled.

Since $\dfrac{\cos A + 2\cos C}{\cos A + 2\cos B} = \dfrac{\sin B}{\sin C}$,

$\therefore \sin C\cos A + 2\sin C\cos C = \cos A\sin B + 2\sin B\cos B.$

Hence $(\sin C - \sin B)\cos A = \sin 2B - \sin 2C,$

$\therefore 2\cos\dfrac{C+B}{2}\sin\dfrac{C-B}{2}\cos A = 2\cos(B+C)\sin(B-C).$

But in any triangle ABC, $\cos(B+C) = -\cos A$, and $\sin(B-C)$ is always equal to $-\sin(C-B)$.

$\therefore \cos\dfrac{C+B}{2}\sin\dfrac{C-B}{2}\cos A = -\cos A\,.\,\{-\sin(C-B)\}.$

$\therefore \cos\dfrac{C+B}{2}\sin\dfrac{C-B}{2}\cos A = \cos A\,.\,\sin(C-B).$

$\therefore \cos\dfrac{C+B}{2}\sin\dfrac{C-B}{2}\cos A$

$$= 2\cos A\sin\frac{C-B}{2}\cos\frac{C-B}{2} \quad . \quad . \quad . \quad (1)$$

If neither $\cos A$ nor $\sin\dfrac{C-B}{2}$ is equal to zero, the relation (1) reduces to

$$\cos\frac{C+B}{2} = 2\cos\frac{C-B}{2}.$$

$$\therefore \cos\frac{C+B}{2} - \cos\frac{C-B}{2} = \cos\frac{C-B}{2}.$$

$$\therefore -2\sin\frac{C}{2}\sin\frac{B}{2} = \cos\frac{C}{2}\cos\frac{B}{2} + \sin\frac{C}{2}\sin\frac{B}{2}.$$

$$\therefore -3\sin\frac{C}{2}\sin\frac{B}{2} = \cos\frac{C}{2}\cos\frac{B}{2}.$$

$$\therefore \tan\frac{C}{2}\tan\frac{B}{2} = -\frac{1}{3} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

But B and C are angles of a triangle, therefore $\dfrac{B}{2}$ and $\dfrac{C}{2}$ must each lie between 0° and 90°.

Therefore the solution (2) is impossible.

Hence, if the relation (1) is to hold good, we must have either $\cos A = 0$, or $\sin\dfrac{C-B}{2} = 0$.

Now, if $\cos A = 0$, $A = 90°$ and the triangle is right angled. If $\sin\dfrac{C-B}{2} = 0$, $\dfrac{C-B}{2} = 0$; and then $B = C$—that is, the triangle is isosceles.

Kindly refer to Rule 1.

Scamp.—Show that if $x^n + py^n + qz^n$ is exactly divisible by $x^2 - (ay + bz)x + abyz$, then $\dfrac{p}{a^n} + \dfrac{q}{b^n} + 1 = 0$.

(Hall and Knight's *Elementary Algebra.*)

Since $x^2 - (ay + bz)x + abyz$ may be written in the form $(x - ay)(x - bz)$, we must have

$$(x - ay)(x - bz)Q = x^n + py^n + qz^n.$$

Put $x = ay$; $\therefore a^ny^n + py^n + qz^n = 0.$ (§ 230.)

Again, put $x = bz$; $\therefore b^nz^n + py^n + qz^n = 0.$

Hence $(a^n + p)y^n = -qz^n.$

$$\therefore z^n = -\frac{a^n + p}{q}y^n.$$

Therefore the equation, $b^nz^n + py^n + qz^n = 0$, may be written

$$-b^n\frac{a^n + p}{q}y^n + py^n - q\frac{a^n + p}{q}y^n = 0.$$

$$\therefore -b^n\frac{a^n + p}{q} + p - (a^n + p) = 0.$$

$$\therefore p - (a^n + p)\left(\frac{b^n}{q} + 1\right) = 0.$$

$$\therefore pq - (a^n + p)(b^n + q) = 0.$$

$$\therefore pq - a^nb^n - qa^n - b^np - pq = 0.$$

$$\therefore -a^nb^n - qa^n - b^np = 0.$$

$$\therefore 1 + \frac{q}{b^n} + \frac{p}{a^n} = 0.$$

J. H. W.—For the L.C.P. examination, Smith's or Taylor's *Geometrical Conics*, Loney's *Analytical Geometry*. For the F.C.P. examination, Smith's *Geometrical Conics*, Askwith's *Pure Geometry* (Cambridge University Press), Loney's *Analytical Geometry*, Lamb's *Infinitesimal Calculus*.

Todhunter's works are hardly up to date. Loney's *Trigonometry* would probably suit you.

Rex.—Your solution is correct, but rather long. The following is shorter.

$$\frac{a}{b} = \frac{c}{d}.$$

$$\therefore \frac{ma}{nb} = \frac{mc}{nd}.$$

$$\therefore \frac{ma - nb}{nb} = \frac{mc - nd}{nd}.$$

$$\therefore \frac{nb}{nd} = \frac{ma - nb}{mc - nd}.$$

$$\therefore \frac{b}{d} = \frac{ma - nb}{mc - nd}.$$

$$\text{But } \frac{b}{d} = \frac{a}{c}.$$

$$\therefore \frac{a}{c} = \frac{ma - nb}{mc - nd}.$$

The relation you quote is not correct.

Lady Winifred.—We should advise you to read the following works in preparing for the London B.Sc. examination in Applied Mathematics under the regulations for External Students for 1905 and subsequent years:—Love's *Theoretical Mechanics* (Cambridge University Press), Greaves' *Elementary Hydrostatics* (Cambridge University Press), Minchin's *Statics* (Oxford University Press).

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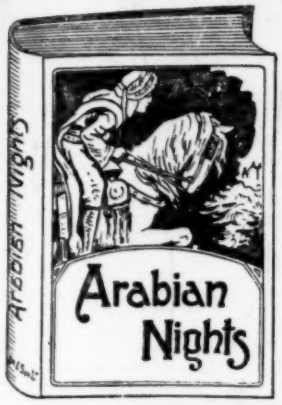

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New Trigonometry for Schools. Borchardt and Perrott. This book marks a step forward in the practical way in which the subject is treated. The theory is treated with sufficient fullness to secure the disciplinary advantages of the deductive reasoning which makes trigonometry so valuable as a school subject, while the use of graphical methods enables the student to put a definite meaning into his work that is often wanting among school boys, and it emphasises the fact, which is seldom insisted on in the early stages of trigonometry, that the ratios are actual numbers.

ADAM AND CHARLES BLACK.

Asia.—Reader Vb. By L. W. Lyde, M.A. This book deals with the geography of that part of the world which is of particular interest to our children and general readers at the present time. It is therefore opportune. As it is full and well written, it will be of much assistance in the groundwork of class teaching; but the author has confined himself to a description only of the continent, and has left details to be filled in by the teacher or by wider reading. The book is therefore incomplete as regards its use for teaching purposes; and where the staff of a school is young and inexperienced, it is of very little use. The power of filling in details on the part of a teacher is only obtained by wide and extensive reading, and young teachers cannot be expected to know the things which, after all, go to make geography interesting and attractive. In some schools the book is positively worthless; but where the teachers are thoroughly capable, it is exceedingly suggestive. The illustrations are well chosen, and are reproductions of photographs. The summary, too, for purposes of revision and learning by heart, is very helpful. The spelling of names is that found in Mr Chisholm's gazetteer.

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Selections from Henry IV. A story of the play, a well-selected portion for reading or study, and a helpful set of notes make up an excellent little book.

A Primer of Old French. By G. H. Clarke, M.A., and C. J. Murray, B.A. This short work consists of a historical outline of the growth of the French language, a short accidence of old French, and examples of early French, ranging from the Serments de Strasbourg through the religious poems and Chansons de Geste to the end of the fifteenth century. The extracts are well chosen, with a view of showing that in mediæval French there is a great deal which is worth reading for its own sake. The extracts given are accompanied by renderings into modern French on the opposite pages. We think it a pity that this method has been followed. The modern French versions give ample proof of the ability of the editors, although we could point to several instances where the connection between present and past French would have been more clearly shown by the choice of words and phrases directly derived from those used in the old French text. The objections to this method of parallel renderings are, we think, very weighty. It is a less fault in a work of this kind to do too little than to do too much. The student will be tempted to scamp the grammatical introduction and to skim through the extracts given with the help of the modern French version. Had the modern French version been replaced by a vocabulary, the student would have been left more to his own resources, and he would have been able to carry away from a study of this book knowledge of a definite character which he could have used in continuing his reading of old French.

A Book of French Prosody, with Specimens of French Verse from the Twelfth Century to the Present Day. By Louis M. Brandin, Ph.D., Professor of Romance Philology at University College, London, and W. G. Hartog, B.A. (Lond.), Lecturer in French at University College, London. This book is a welcome addition to the number, not by any means too large, of works in English dealing with the intricate subject of French prosody. Being mainly intended for advanced students already possessing some knowledge of French poetry, it compresses within narrow limits the discussion of the number of syllables formed by groups of vowels, and refrains from dogmatising on the obscure topic of the *rôle* of the accent. On the other hand, it deals exhaustively with the questions of assonance, consonance, the cæsura, the hiatus, enjambement, and the varied arrangements of rhymes in French. The part played by alliteration in French verse, which has been left untouched in previous treatises on French prosody written for English readers, has a chapter to itself. The work contains, in addition, about 150 pages of extracts from poets of the thirteenth century up to the present day. The selections are well made, and should be very useful in guiding the student's reading. This is the best book of its kind which has ever come under our notice. It should be in the hands of all students and readers of French verse.

German Strong Verbs and Irregular Weak Verbs. With notes by Carl Keath, L.C.P., Assistant Master, Pen-y-Groes County Intermediate School. This is an unpretentious but very useful little book. The strong verbs are divided into classes as in most modern German grammars. In addition to the strong verbs, the verbs *sein* and *haben* and other auxiliaries of mood and tense are conjugated, and a verb is conjugated in the passive voice as a type. The systematising of the study of the strong verbs should do much to lighten the necessary drudgery involved in the study of German grammar.

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Whitaker's Modern Method of Learning German. By C. W. Whitaker, B.A., Oxford, and H. G. Braun, Ph.D., Leipsic. We have examined this book carefully, and fail to understand how it can justify its claim to be a "modern method." "Modern" it certainly is not, and it is only methodical in the sense that a definite arrangement is followed throughout the book, but not in the sense that the system pursued is likely to lead the pupil to the end for which the book is written. It commences with a grammatical introduction of fifty-six pages. The pupil is evidently expected to plod his weary way through the whole of this before commencing the exercises, as no subsequent reference is made to it in the exercises. Then follow twenty-eight lessons describing the journey of a Mr. Williams from London to Berlin. Each lesson consists of an extract for reading, with the pronunciation represented below, the same exercise with a literal rendering, and a conversation on the exercise. The value of the figured pronunciation may be gauged by the fact that the pupil is taught to pronounce *Geld* as "gaylt," *König* as "kirneesh." *wann* as "vunn," etc. No more complete delusion could exist than that a literal translation of German into English, continued to the end of the course, is an effective help to the student. In the earlier stages an occasional literal rendering may be of use to the pupil, but it is at best only a prop, which must be discarded as early as possible. If the student during the whole of his course has continually presented to his eye the difference in order between the words in the English and in the German sentence, he continues to regard the German order of words as something abnormal and eccentric. The object of good teaching should be to free him from this dependence on his mother tongue, and to create a complete association between the order of the words in the German sentence and the words themselves. The conversations are both practical and useful, but the remainder of the book contains nothing specially worthy of note.

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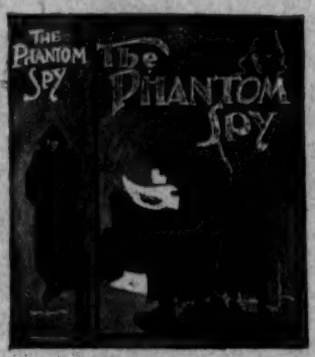

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